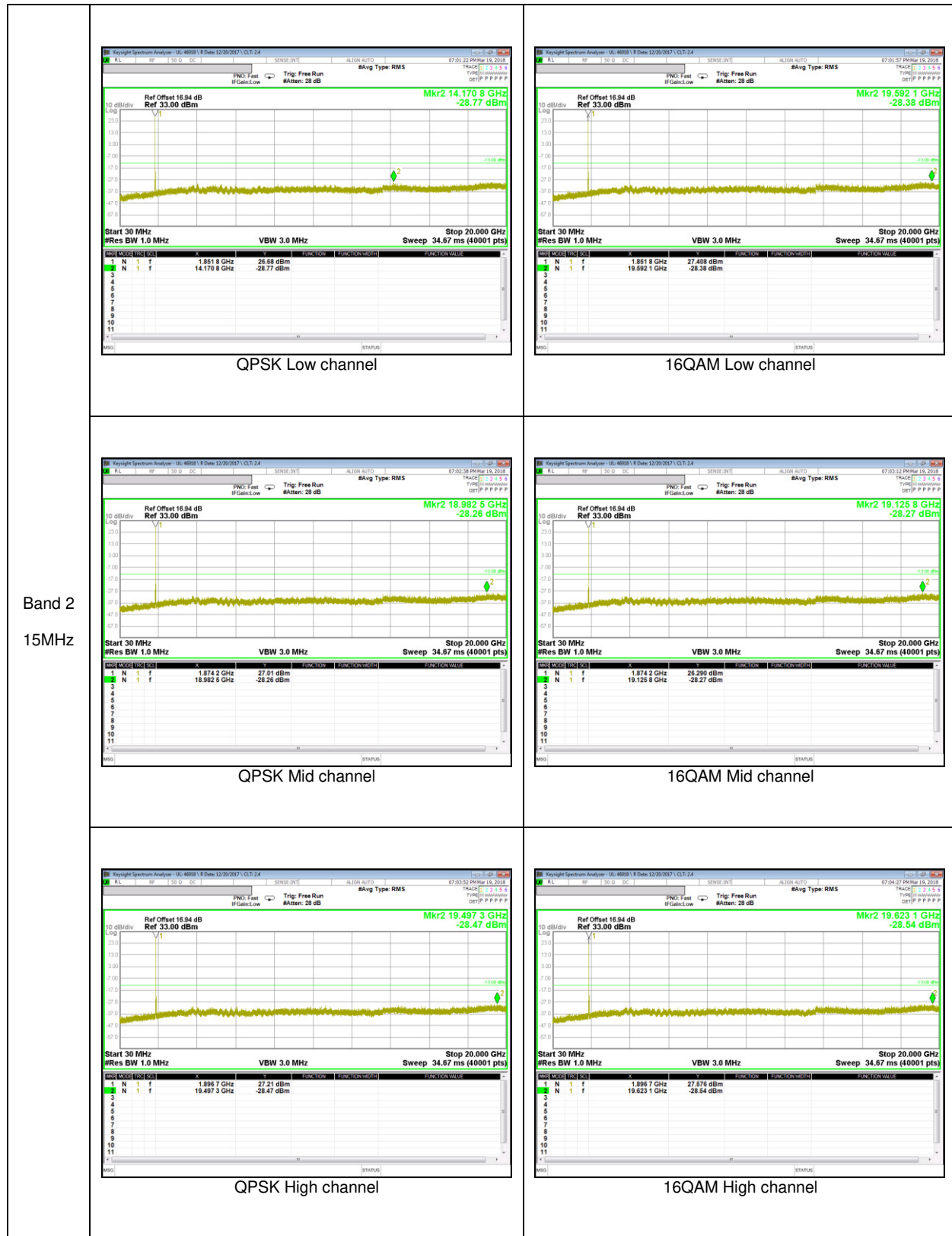
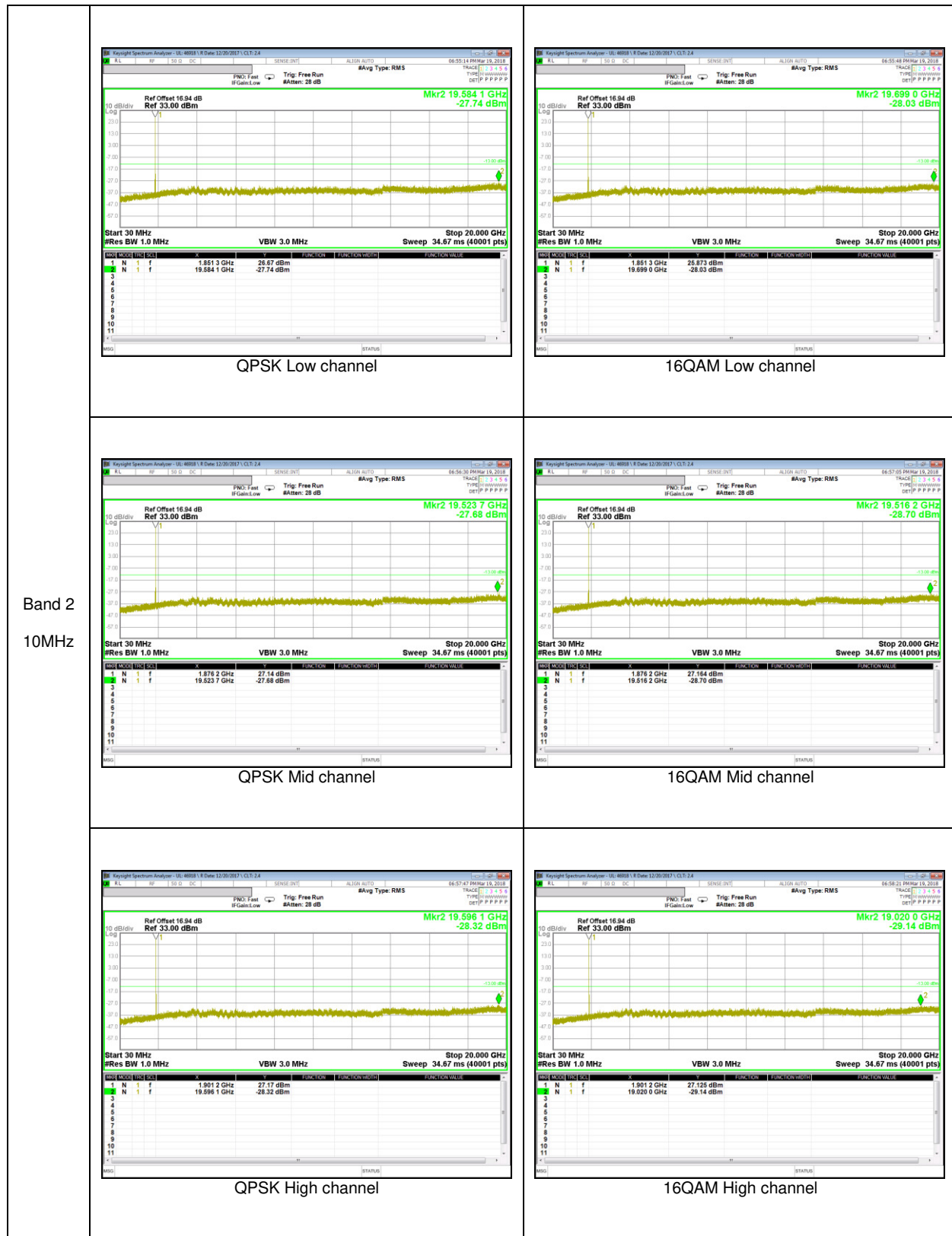
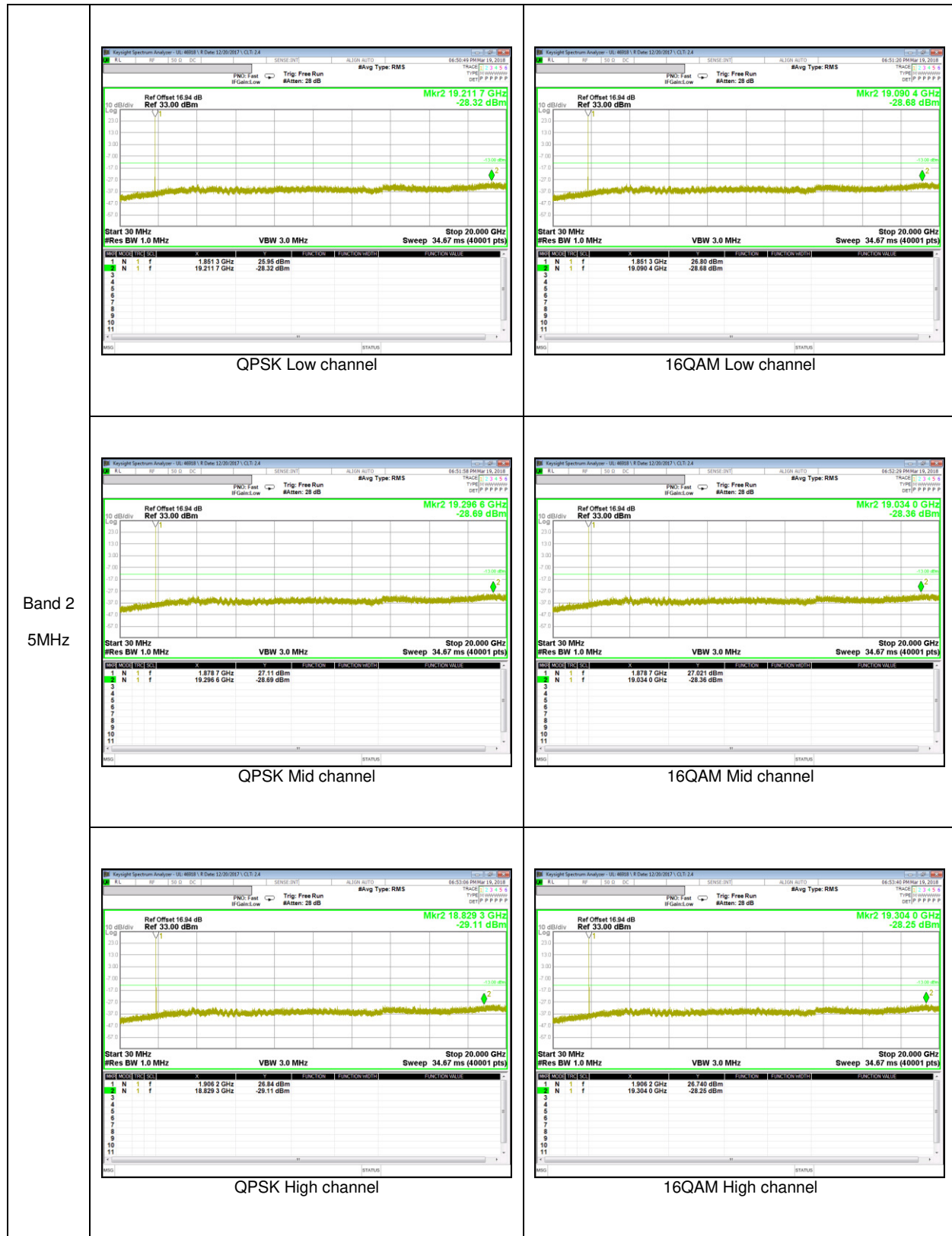
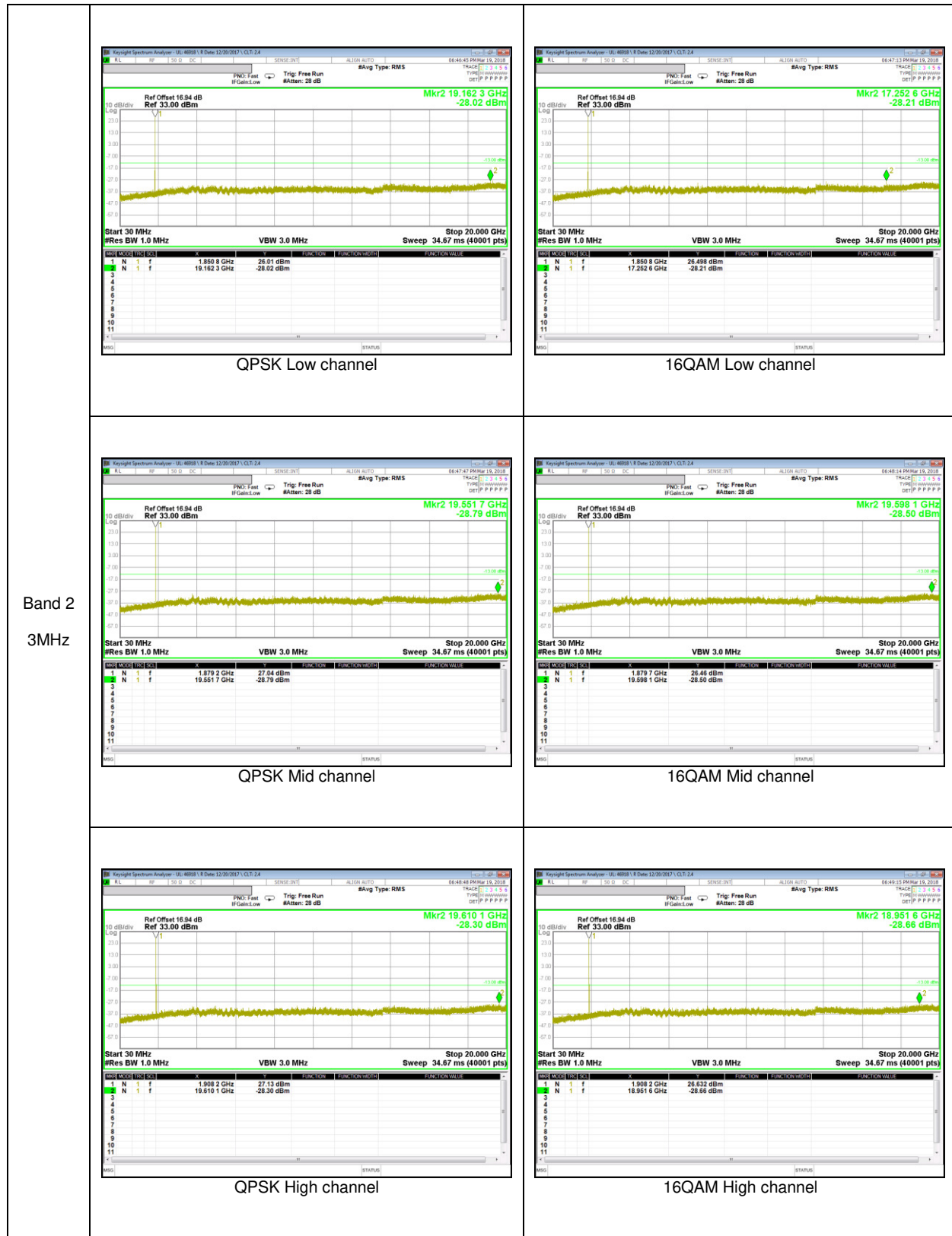
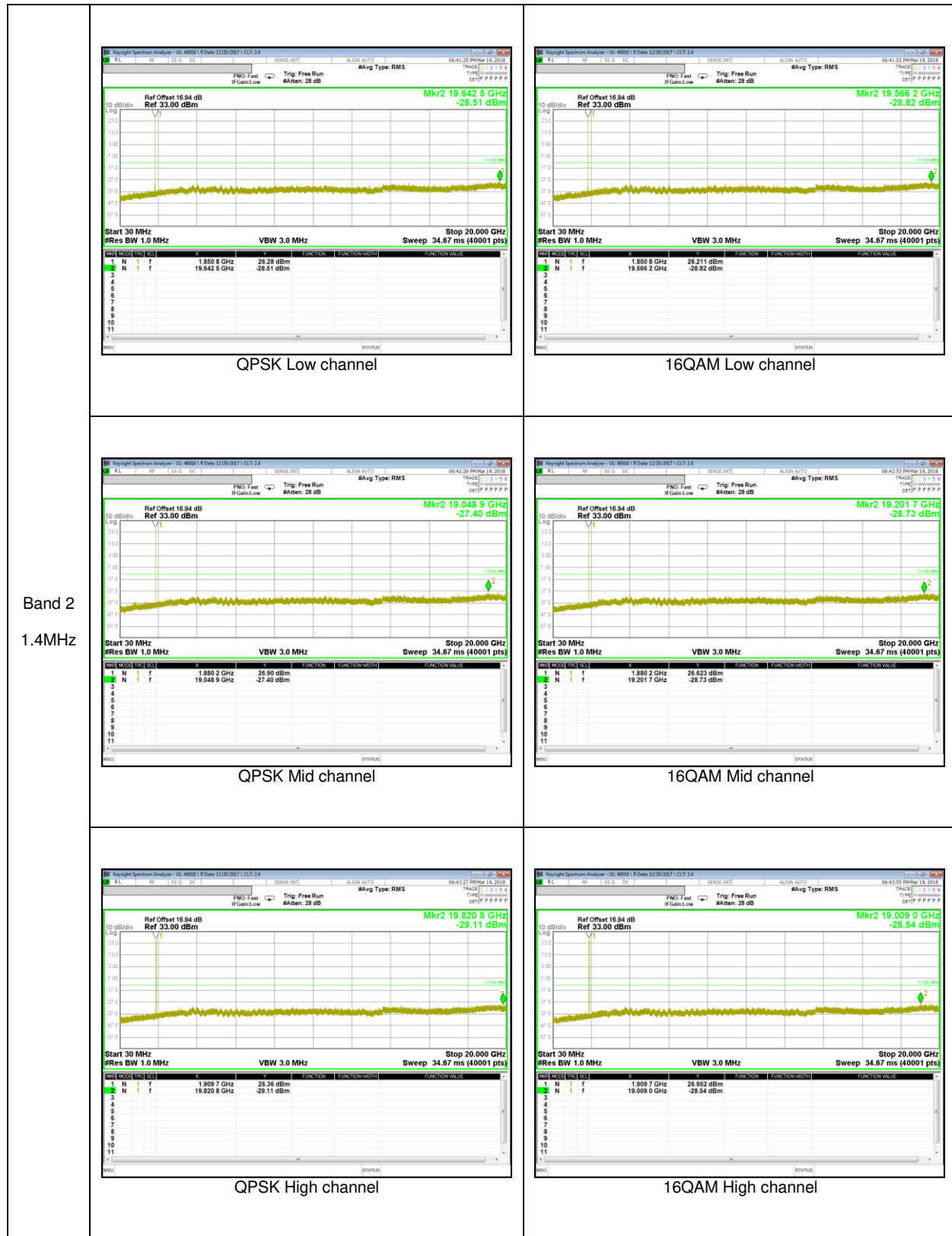




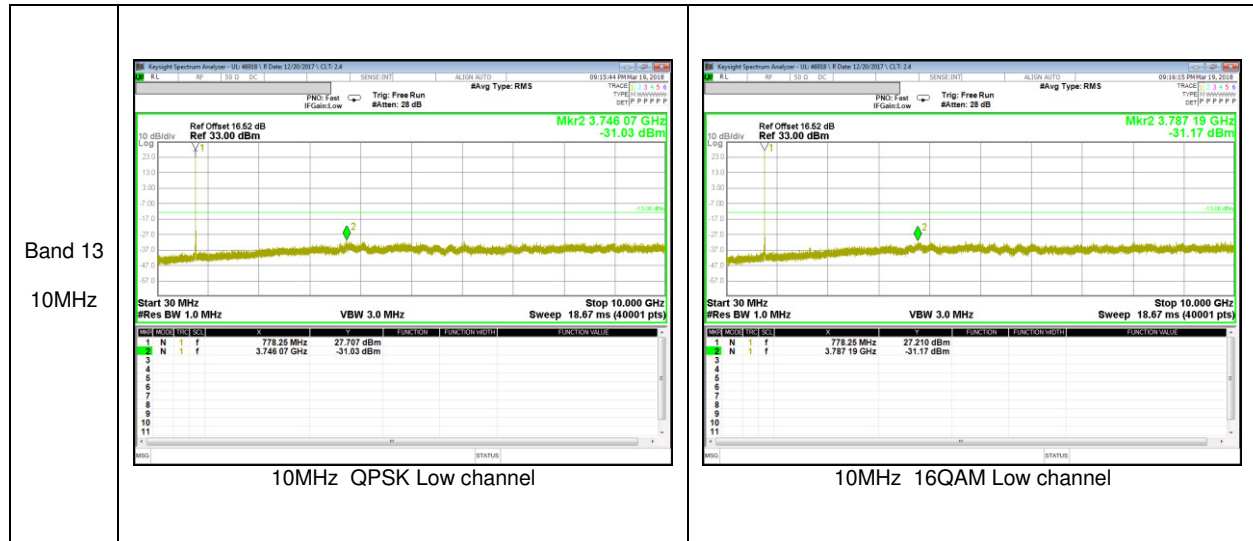


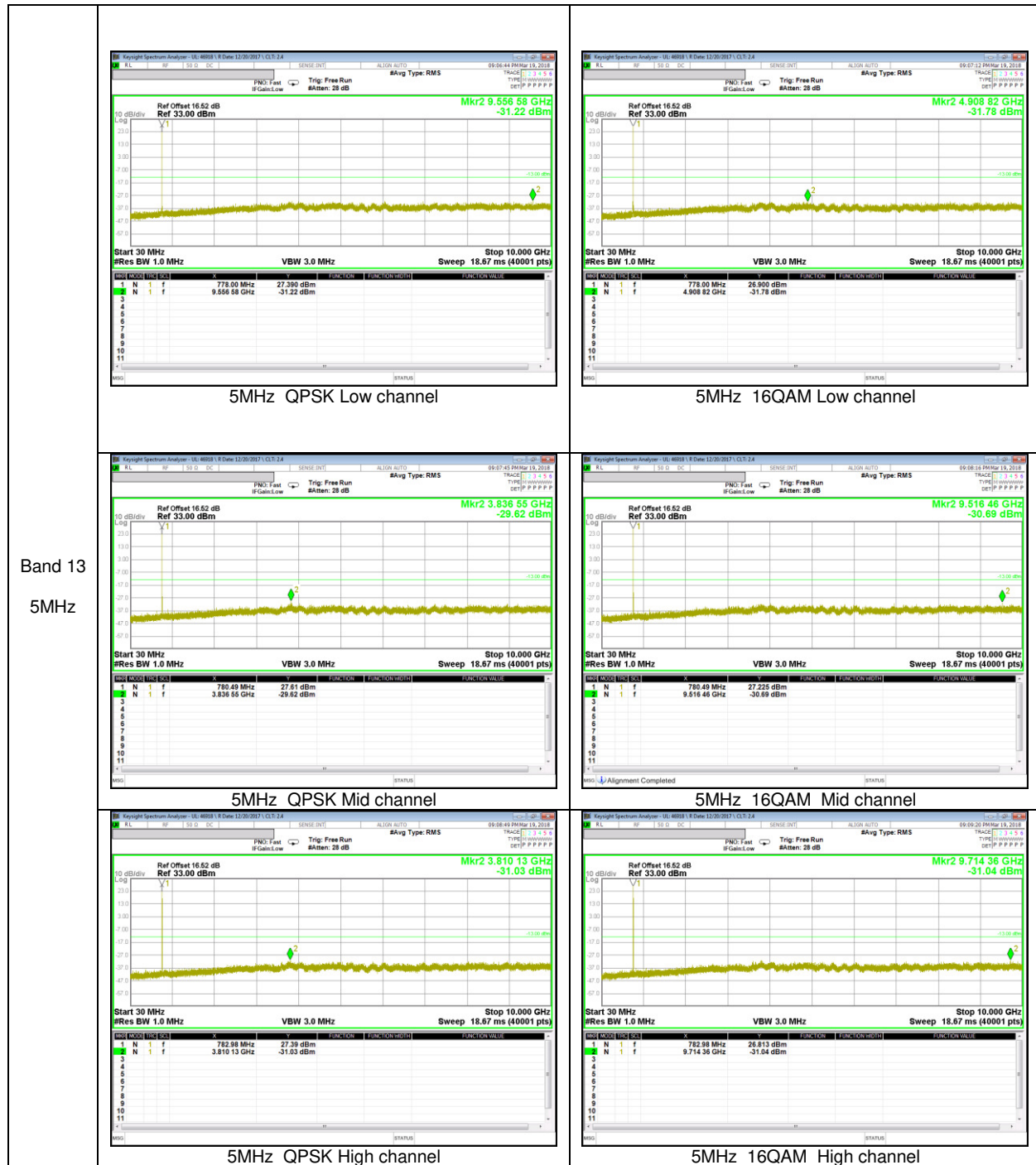




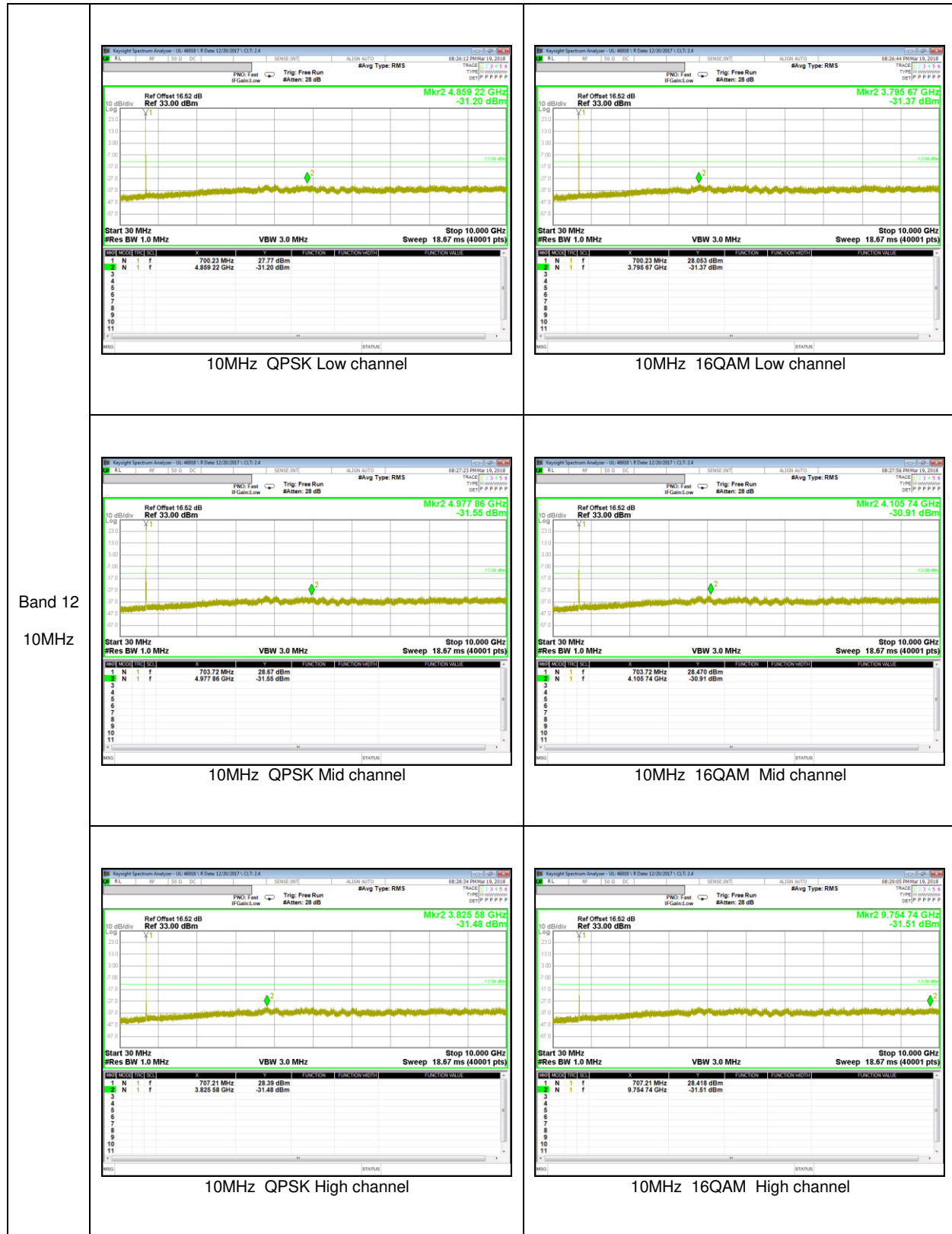


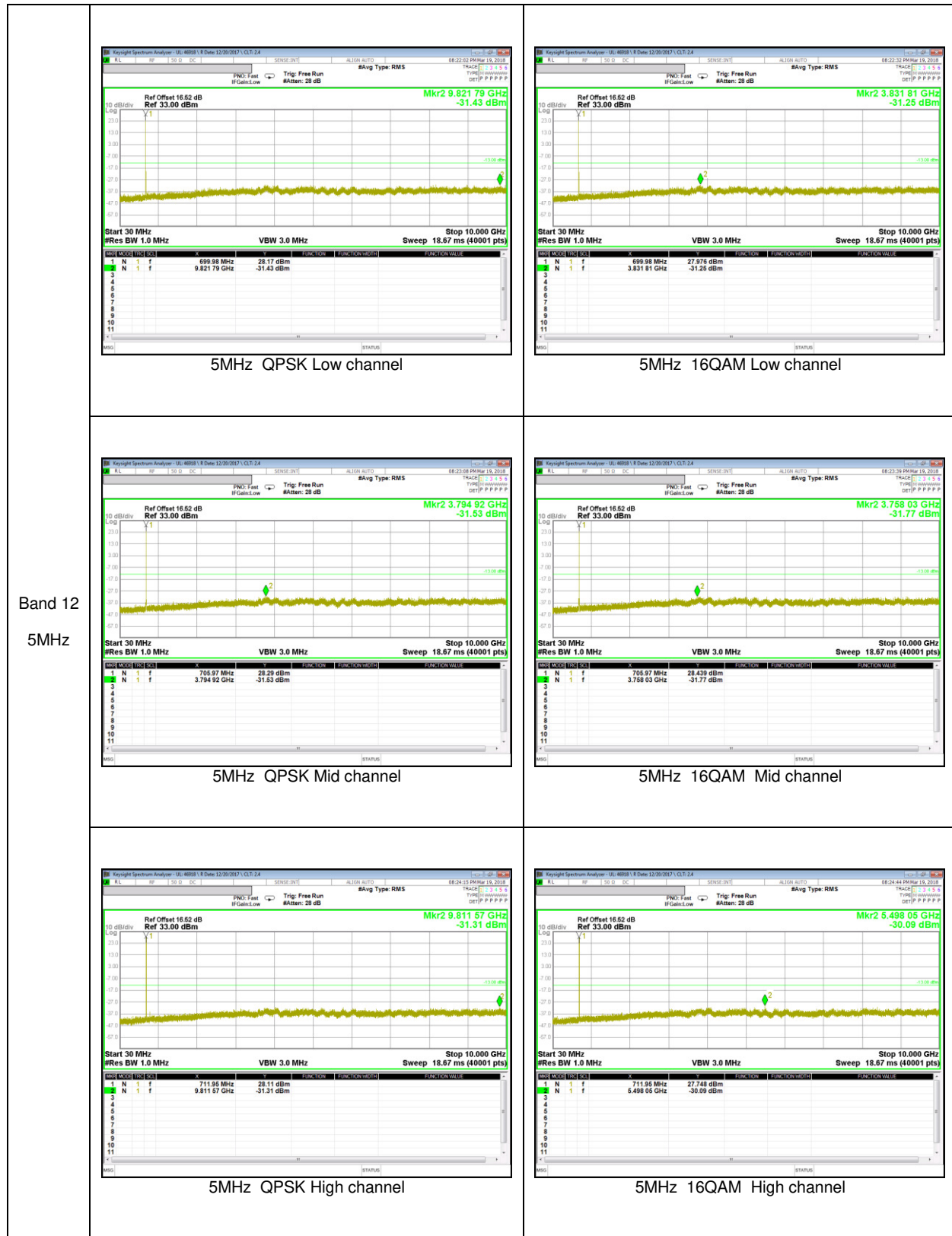
**LTE Band 13**

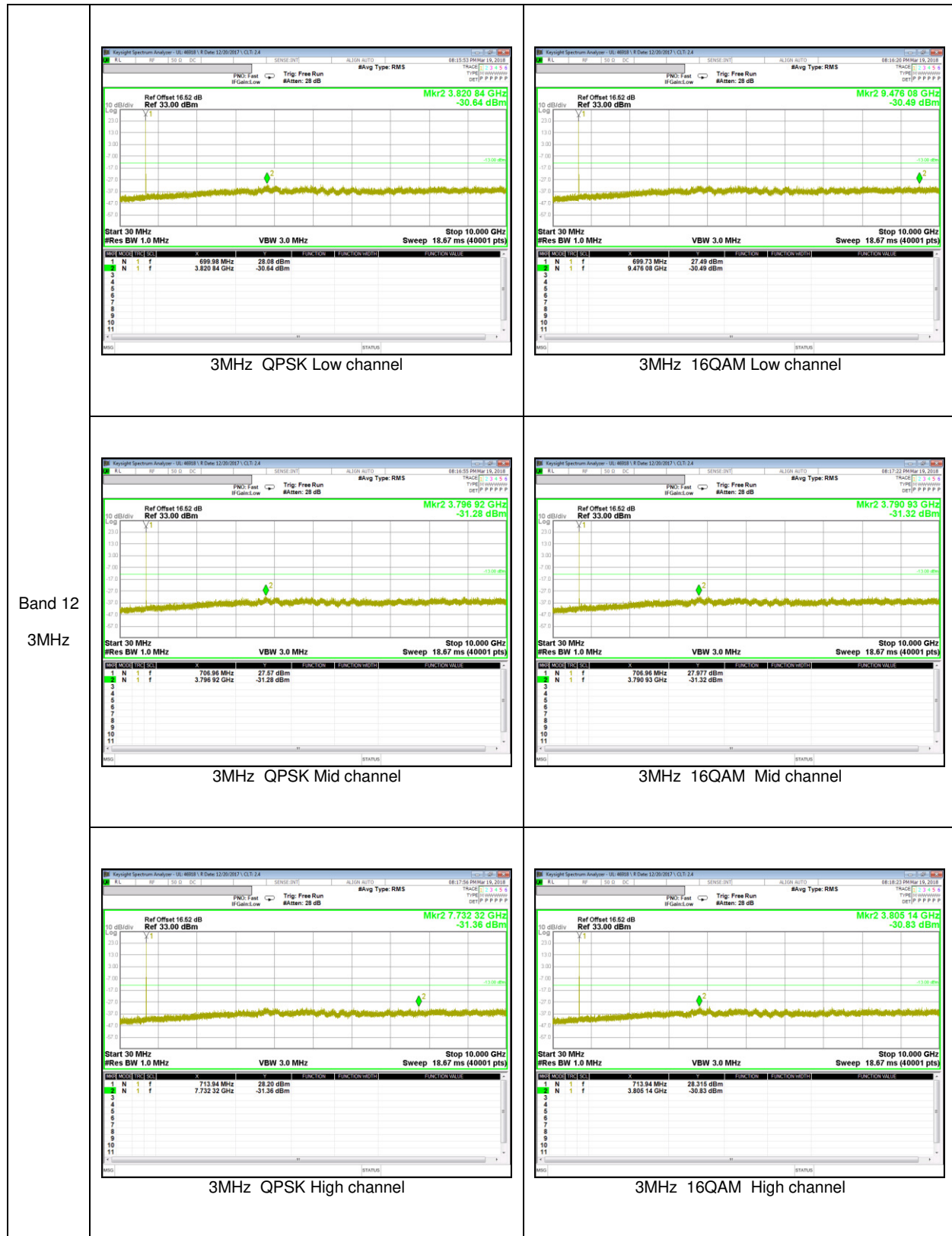


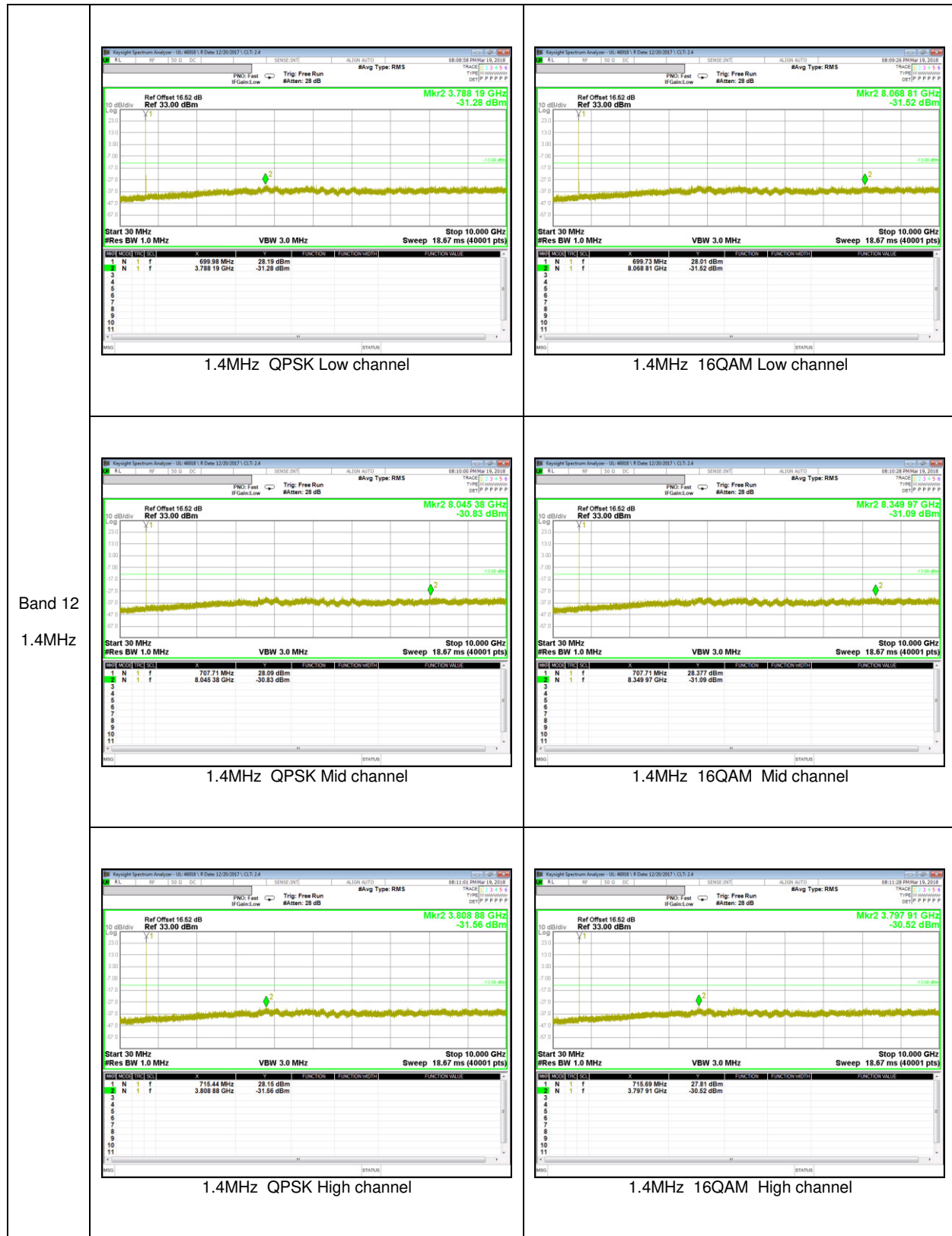


**LTE Band 12**









## **9.4. FREQUENCY STABILITY**

### **RULE PART(S)**

FCC: §2.1055, §22.355, §24.235 and §27.54

### **LIMITS**

§22.355 - The carrier frequency shall not depart from the reference frequency in excess of  $\pm 2.5$  ppm for mobile stations.

§24.235 - The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

§27.54 - The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

### **TEST PROCEDURE**

Per KDB 971168 D01 Power Meas License Digital Systems v03

### **RESULTS**

See the following pages.

### 9.4.1. FREQUENCY STABILITY RESULTS

#### GSM 850, Channel 190, Frequency 836.6 MHz

| Reference Frequency : GSM850 Mid Channel 836.6 MHz @ 20°C<br>Limit: +- 2.5 ppm = 2091.500 Hz |                                 |                                               |             |             |
|----------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Power Supply<br>[Vdc]                                                                        | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                                              |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| 3.85                                                                                         | 50                              | 836.60004136                                  | -0.001      | 2.5         |
| 3.85                                                                                         | 40                              | 836.60003925                                  | 0.001       | 2.5         |
| 3.85                                                                                         | 30                              | 836.60004888                                  | -0.010      | 2.5         |
| <b>3.85</b>                                                                                  | <b>20</b>                       | 836.60004033                                  | <b>0</b>    | <b>2.5</b>  |
| 3.85                                                                                         | 10                              | 836.60004642                                  | -0.007      | 2.5         |
| 3.85                                                                                         | 0                               | 836.60004678                                  | -0.008      | 2.5         |
| 3.85                                                                                         | -10                             | 836.60004510                                  | -0.006      | 2.5         |
| 3.85                                                                                         | -20                             | 836.60004891                                  | -0.010      | 2.5         |
| 3.85                                                                                         | -30                             | 836.60004155                                  | -0.001      | 2.5         |

| Reference Frequency : GSM850 Mid Channel 836.6 MHz @ 20°C<br>Limit: +- 2.5 ppm = 2091.500 Hz |                                 |                                               |             |             |
|----------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Power Supply<br>[Vdc]                                                                        | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                                              |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| <b>3.85</b>                                                                                  | <b>20</b>                       | <b>836.60004033</b>                           | <b>0</b>    | <b>2.5</b>  |
| 4.40                                                                                         | 20                              | 836.60004628                                  | -0.007      | 2.5         |
| 3.60                                                                                         | 20                              | 836.60004502                                  | -0.006      | 2.5         |

**GSM 1900, Channel 661, Frequency 1880.0 MHz**

| Reference Frequency: GSM1900 Mid Channel 1880.0 MHz @ 20°C |                                 |                                               |             |             |
|------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 4700.000 Hz                            |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                      | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                            |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| 3.85                                                       | 50                              | 1880.00005530                                 | 0.003       | 2.5         |
| 3.85                                                       | 40                              | 1880.00006105                                 | 0.000       | 2.5         |
| 3.85                                                       | 30                              | 1880.00006001                                 | 0.000       | 2.5         |
| <b>3.85</b>                                                | <b>20</b>                       | 1880.00006080                                 | <b>0</b>    | <b>2.5</b>  |
| 3.85                                                       | 10                              | 1880.00005942                                 | 0.001       | 2.5         |
| 3.85                                                       | 0                               | 1880.00005630                                 | 0.002       | 2.5         |
| 3.85                                                       | -10                             | 1880.00006087                                 | 0.000       | 2.5         |
| 3.85                                                       | -20                             | 1880.00006284                                 | -0.001      | 2.5         |
| 3.85                                                       | -30                             | 1880.00006174                                 | -0.001      | 2.5         |

| Reference Frequency: GSM1900 Mid Channel 1880.0 MHz @ 20°C |                                 |                                               |             |             |
|------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 4700.000 Hz                            |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                      | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                            |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| <b>3.85</b>                                                | <b>20</b>                       | <b>1880.00006080</b>                          | <b>0</b>    | <b>2.5</b>  |
| 4.40                                                       | 20                              | 1880.00005441                                 | 0.003       | 2.5         |
| 3.60                                                       | 20                              | 1880.00006231                                 | -0.001      | 2.5         |

**WCDMA Band 5 , Channel 4183, Frequency 836.6 MHz**

| Reference Frequency: WCDMA Band 5 Mid Channel 836.6 MHz @ 20°C |                                 |                                               |             |             |
|----------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 2091.500 Hz                                |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                          | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| 3.85                                                           | 50                              | 836.60001509                                  | 0.001       | 2.5         |
| 3.85                                                           | 40                              | 836.60001702                                  | -0.002      | 2.5         |
| 3.85                                                           | 30                              | 836.60001061                                  | 0.006       | 2.5         |
| <b>3.85</b>                                                    | <b>20</b>                       | 836.60001558                                  | <b>0</b>    | <b>2.5</b>  |
| 3.85                                                           | 10                              | 836.60001471                                  | 0.001       | 2.5         |
| 3.85                                                           | 0                               | 836.60000956                                  | 0.007       | 2.5         |
| 3.85                                                           | -10                             | 836.60001194                                  | 0.004       | 2.5         |
| 3.85                                                           | -20                             | 836.60001620                                  | -0.001      | 2.5         |
| 3.85                                                           | -30                             | 836.60001574                                  | 0.000       | 2.5         |

| Reference Frequency: WCDMA Band 5 Mid Channel 836.6 MHz @ 20°C |                                 |                                               |             |             |
|----------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 2091.500 Hz                                |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                          | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| <b>3.85</b>                                                    | <b>20</b>                       | <b>836.60001558</b>                           | <b>0</b>    | <b>2.5</b>  |
| 4.40                                                           | 20                              | 836.60001907                                  | -0.004      | 2.5         |
| 3.60                                                           | 20                              | 836.60001322                                  | 0.003       | 2.5         |

**WCDMA Band 2 , Channel 9400, Frequency 1880.0 MHz**

| Reference Frequency: WCDMA Band 2 Mid Channel 1880.0 MHz @ 20°C |                                 |                                               |             |             |
|-----------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 4700.000 Hz                                 |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                           | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                 |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| 3.85                                                            | 50                              | 1879.99997194                                 | -0.002      | 2.5         |
| 3.85                                                            | 40                              | 1879.99996782                                 | 0.000       | 2.5         |
| 3.85                                                            | 30                              | 1879.99997467                                 | -0.004      | 2.5         |
| <b>3.85</b>                                                     | <b>20</b>                       | 1879.99996772                                 | <b>0</b>    | <b>2.5</b>  |
| 3.85                                                            | 10                              | 1879.99997184                                 | -0.002      | 2.5         |
| 3.85                                                            | 0                               | 1879.99997203                                 | -0.002      | 2.5         |
| 3.85                                                            | -10                             | 1879.99996391                                 | 0.002       | 2.5         |
| 3.85                                                            | -20                             | 1879.99996398                                 | 0.002       | 2.5         |
| 3.85                                                            | -30                             | 1879.99997464                                 | -0.004      | 2.5         |

| Reference Frequency: WCDMA Band 2 Mid Channel 1880.0 MHz @ 20°C |                                 |                                               |             |             |
|-----------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 4700.000 Hz                                 |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                           | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                 |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| <b>3.85</b>                                                     | <b>20</b>                       | <b>1879.99996772</b>                          | <b>0</b>    | <b>2.5</b>  |
| 4.40                                                            | 20                              | 1879.99996981                                 | -0.001      | 2.5         |
| 3.60                                                            | 20                              | 1879.99997019                                 | -0.001      | 2.5         |

**WCDMA Band 4, Channel 1413, Frequency 1732.6 MHz**

| Reference Frequency: WCDMA Band 4 Mid Channel 1732.6 MHz @ 20°C |                                 |                                               |             |             |
|-----------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 4331.500 Hz                                 |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                           | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                 |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| 3.85                                                            | 50                              | 1732.59998463                                 | -0.002      | 2.5         |
| 3.85                                                            | 40                              | 1732.59997716                                 | 0.002       | 2.5         |
| 3.85                                                            | 30                              | 1732.59997922                                 | 0.001       | 2.5         |
| <b>3.85</b>                                                     | <b>20</b>                       | 1732.59998084                                 | <b>0</b>    | <b>2.5</b>  |
| 3.85                                                            | 10                              | 1732.59998307                                 | -0.001      | 2.5         |
| 3.85                                                            | 0                               | 1732.59998618                                 | -0.003      | 2.5         |
| 3.85                                                            | -10                             | 1732.59998281                                 | -0.001      | 2.5         |
| 3.85                                                            | -20                             | 1732.59998694                                 | -0.004      | 2.5         |
| 3.85                                                            | -30                             | 1732.59998656                                 | -0.003      | 2.5         |

| Reference Frequency: WCDMA Band 4 Mid Channel 1732.6 MHz @ 20°C |                                 |                                               |             |             |
|-----------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 4331.500 Hz                                 |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                           | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                 |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| <b>3.85</b>                                                     | <b>20</b>                       | <b>1732.59998084</b>                          | <b>0</b>    | <b>2.5</b>  |
| 4.40                                                            | 20                              | 1732.59997770                                 | 0.002       | 2.5         |
| 3.60                                                            | 20                              | 1732.59997898                                 | 0.001       | 2.5         |

**LTE Band 66, Channel 132322, Frequency 1745.0 MHz**

| Reference Frequency: LTE Band 66 Mid Channel 1745 MHz @ 20°C |                                 |                                               |             |             |
|--------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 4362.500 Hz                              |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                        | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                              |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| 3.85                                                         | 50                              | 1744.99997742                                 | -0.001      | 2.5         |
| 3.85                                                         | 40                              | 1744.99997821                                 | -0.001      | 2.5         |
| 3.85                                                         | 30                              | 1744.99997592                                 | 0.000       | 2.5         |
| <b>3.85</b>                                                  | <b>20</b>                       | 1744.99997582                                 | <b>0</b>    | <b>2.5</b>  |
| 3.85                                                         | 10                              | 1744.99997647                                 | 0.000       | 2.5         |
| 3.85                                                         | 0                               | 1744.99997994                                 | -0.002      | 2.5         |
| 3.85                                                         | -10                             | 1744.99997165                                 | 0.002       | 2.5         |
| 3.85                                                         | -20                             | 1744.99997938                                 | -0.002      | 2.5         |
| 3.85                                                         | -30                             | 1744.99998060                                 | -0.003      | 2.5         |

| Reference Frequency: LTE Band 66 Mid Channel 1745 MHz @ 20°C |                                 |                                               |             |             |
|--------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 4362.500 Hz                              |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                        | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                              |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| <b>3.85</b>                                                  | <b>20</b>                       | <b>1744.99997582</b>                          | <b>0</b>    | <b>2.5</b>  |
| 4.40                                                         | 20                              | 1744.99997536                                 | 0.000       | 2.5         |
| 3.60                                                         | 20                              | 1744.99997176                                 | 0.002       | 2.5         |

**LTE Band 2, Channel 18900, Frequency 1880.0 MHz**

| Reference Frequency: LTE Band 2 Mid Channel 1880 MHz @ 20°C |                                 |                                               |             |             |
|-------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 4700.000 Hz                             |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                       | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                             |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| 3.85                                                        | 50                              | 1880.00002660                                 | -0.003      | 2.5         |
| 3.85                                                        | 40                              | 1880.00002361                                 | -0.002      | 2.5         |
| 3.85                                                        | 30                              | 1880.00001658                                 | 0.002       | 2.5         |
| <b>3.85</b>                                                 | <b>20</b>                       | 1880.00002020                                 | <b>0</b>    | <b>2.5</b>  |
| 3.85                                                        | 10                              | 1880.00002113                                 | 0.000       | 2.5         |
| 3.85                                                        | 0                               | 1880.00002174                                 | -0.001      | 2.5         |
| 3.85                                                        | -10                             | 1880.00001660                                 | 0.002       | 2.5         |
| 3.85                                                        | -20                             | 1880.00002587                                 | -0.003      | 2.5         |
| 3.85                                                        | -30                             | 1880.00002064                                 | 0.000       | 2.5         |

| Reference Frequency: LTE Band 2 Mid Channel 1880 MHz @ 20°C |                                 |                                               |             |             |
|-------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 4700.000 Hz                             |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                       | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                             |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| <b>3.85</b>                                                 | <b>20</b>                       | <b>1880.00002020</b>                          | <b>0</b>    | <b>2.5</b>  |
| 4.40                                                        | 20                              | 1880.00002723                                 | -0.004      | 2.5         |
| 3.60                                                        | 20                              | 1880.00001855                                 | 0.001       | 2.5         |

**LTE Band 13, Channel 23230, Frequency 782.0 MHz**

| Reference Frequency: LTE Band 13 Mid Channel 782 MHz @ 20°C |                                 |                                               |             |             |
|-------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 1955.000 Hz                             |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                       | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                             |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| 3.85                                                        | 50                              | 781.99997980                                  | 0.000       | 2.5         |
| 3.85                                                        | 40                              | 781.99998398                                  | -0.005      | 2.5         |
| 3.85                                                        | 30                              | 781.99997816                                  | 0.002       | 2.5         |
| <b>3.85</b>                                                 | <b>20</b>                       | 781.99998011                                  | <b>0</b>    | <b>2.5</b>  |
| 3.85                                                        | 10                              | 781.99997645                                  | 0.005       | 2.5         |
| 3.85                                                        | 0                               | 781.99997857                                  | 0.002       | 2.5         |
| 3.85                                                        | -10                             | 781.99997331                                  | 0.009       | 2.5         |
| 3.85                                                        | -20                             | 781.99997535                                  | 0.006       | 2.5         |
| 3.85                                                        | -30                             | 781.99997773                                  | 0.003       | 2.5         |

| Reference Frequency: LTE Band 13 Mid Channel 782 MHz @ 20°C |                                 |                                               |             |             |
|-------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 1955.000 Hz                             |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                       | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                             |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| <b>3.85</b>                                                 | <b>20</b>                       | <b>781.99998011</b>                           | <b>0</b>    | <b>2.5</b>  |
| 4.40                                                        | 20                              | 781.99998028                                  | 0.000       | 2.5         |
| 3.60                                                        | 20                              | 781.99998377                                  | -0.005      | 2.5         |

**LTE Band 12, Channel 23095, Frequency 707.5 MHz**

| Reference Frequency: LTE Band 12 Mid Channel 707.5 MHz @ 20°C |                                 |                                               |             |             |
|---------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 1768.750 Hz                               |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                         | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                               |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| 3.85                                                          | 50                              | 707.50001353                                  | -0.001      | 2.5         |
| 3.85                                                          | 40                              | 707.50002046                                  | -0.011      | 2.5         |
| 3.85                                                          | 30                              | 707.50001709                                  | -0.007      | 2.5         |
| <b>3.85</b>                                                   | <b>20</b>                       | 707.50001247                                  | <b>0</b>    | <b>2.5</b>  |
| 3.85                                                          | 10                              | 707.50001742                                  | -0.007      | 2.5         |
| 3.85                                                          | 0                               | 707.50001933                                  | -0.010      | 2.5         |
| 3.85                                                          | -10                             | 707.50001811                                  | -0.008      | 2.5         |
| 3.85                                                          | -20                             | 707.50001087                                  | 0.002       | 2.5         |
| 3.85                                                          | -30                             | 707.50001823                                  | -0.008      | 2.5         |

| Reference Frequency: LTE Band 12 Mid Channel 707.5 MHz @ 20°C |                                 |                                               |             |             |
|---------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 1768.750 Hz                               |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                         | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                               |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| <b>3.85</b>                                                   | <b>20</b>                       | <b>707.50001247</b>                           | <b>0</b>    | <b>2.5</b>  |
| 4.40                                                          | 20                              | 707.50001645                                  | -0.006      | 2.5         |
| 3.60                                                          | 20                              | 707.50001929                                  | -0.010      | 2.5         |

**LTE Band 41 , Channel 40620, Frequency 2593.0 MHz**

| Reference Frequency: LTE Band 41 Mid Channel 2593 MHz @ 20°C |                                 |                                               |             |             |
|--------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 6482.500 Hz                              |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                        | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                              |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| 3.85                                                         | 50                              | 2593.00003509                                 | 0.002       | 2.5         |
| 3.85                                                         | 40                              | 2593.00004030                                 | 0.000       | 2.5         |
| 3.85                                                         | 30                              | 2593.00003408                                 | 0.003       | 2.5         |
| <b>3.85</b>                                                  | <b>20</b>                       | 2593.00004082                                 | <b>0</b>    | <b>2.5</b>  |
| 3.85                                                         | 10                              | 2593.00004432                                 | -0.001      | 2.5         |
| 3.85                                                         | 0                               | 2593.00003808                                 | 0.001       | 2.5         |
| 3.85                                                         | -10                             | 2593.00003914                                 | 0.001       | 2.5         |
| 3.85                                                         | -20                             | 2593.00003933                                 | 0.001       | 2.5         |
| 3.85                                                         | -30                             | 2593.00003662                                 | 0.002       | 2.5         |

| Reference Frequency: LTE Band 41 Mid Channel 2593 MHz @ 20°C |                                 |                                               |             |             |
|--------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 6482.500 Hz                              |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                        | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                              |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| <b>3.85</b>                                                  | <b>20</b>                       | <b>2593.00004082</b>                          | <b>0</b>    | <b>2.5</b>  |
| 4.40                                                         | 20                              | 2593.00004390                                 | -0.001      | 2.5         |
| 3.60                                                         | 20                              | 2593.00003949                                 | 0.001       | 2.5         |

**LTE Band 5 , Channel 20524, Frequency 836.5 MHz**

| Reference Frequency: LTE Band 5 Mid Channel 836.5 MHz @ 20°C |                                 |                                               |             |             |
|--------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 2091.250 Hz                              |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                        | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                              |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| 3.85                                                         | 50                              | 836.49997515                                  | -0.001      | 2.5         |
| 3.85                                                         | 40                              | 836.49997189                                  | 0.003       | 2.5         |
| 3.85                                                         | 30                              | 836.49996726                                  | 0.009       | 2.5         |
| <b>3.85</b>                                                  | <b>20</b>                       | 836.49997463                                  | <b>0</b>    | <b>2.5</b>  |
| 3.85                                                         | 10                              | 836.49997574                                  | -0.001      | 2.5         |
| 3.85                                                         | 0                               | 836.49996854                                  | 0.007       | 2.5         |
| 3.85                                                         | -10                             | 836.49997573                                  | -0.001      | 2.5         |
| 3.85                                                         | -20                             | 836.49996624                                  | 0.010       | 2.5         |
| 3.85                                                         | -30                             | 836.49996737                                  | 0.009       | 2.5         |

| Reference Frequency: LTE Band 5 Mid Channel 836.5 MHz @ 20°C |                                 |                                               |             |             |
|--------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 2091.250 Hz                              |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                        | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                              |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| <b>3.85</b>                                                  | <b>20</b>                       | <b>836.49997463</b>                           | <b>0</b>    | <b>2.5</b>  |
| 4.40                                                         | 20                              | 836.49997578                                  | -0.001      | 2.5         |
| 3.60                                                         | 20                              | 836.49996556                                  | 0.011       | 2.5         |

**LTE Band 4**

Due to frequency range and same output power setting, test was carried in LTE Band 66 to cover both LTE Band 66 and LTE Band 4.

**LTE Band 17**

Due to frequency range and same output power setting, test was carried in LTE Band 12 to cover both LTE Band 12 and LTE Band 17.

## 10. RADIATED TEST RESULTS

### 10.1. RADIATED POWER (ERP & EIRP)

#### RULE PART(S)

FCC: §2.1046, §22.913, §24.232 and §27.50

#### LIMITS

22.913(a) - The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232(c) - Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

27.50(h) - (2) Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

27.50(b) (10) - Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

27.50(c) (10) - Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

27.50(d) - (4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.(Band 4)

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13dB.

#### TEST PROCEDURE

ANSI / TIA / EIA 603 E Clause 2.2.17; ESU40 setting reference to 971168 D01 v03

For peak power measurement with a ESU40:

a) Set the RBW  $\geq$  OBW; b) Set VBW  $\geq 3 \times$  RBW; c) Set span  $\geq 2 \times$  RBW; d) Sweep time = auto couple; e) Detector = peak; f) Ensure that the number of measurement points  $\geq$  span/RBW; g) Trace mode = max hold;

For average power measurement with a ESU40:

a) Set span to at least 1.5 times the OBW; b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz; c) Set VBW  $\geq 3 \times$  RBW; d) Set number of points in sweep  $\geq 2 \times$  span / RBW; e) Sweep time = auto-couple; f) Detector = RMS (power averaging); g) Use free run trigger If burst duty cycle  $\geq 98$ ; h) Use trigger to capture bursts If burst duty cycle  $< 98$ ; i) Trace average at least 100 traces in power averaging (*i.e.*, RMS) mode. j) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function. (RBW/VBW are automatically set for LTE B41)

#### TEST RESULTS

### 10.1.1. ERP/EIRP Results

#### GSM

| Band    | Mode  | Channel | f [MHz] | ERP / EIRP |        |
|---------|-------|---------|---------|------------|--------|
|         |       |         |         | [dBm]      | [mW]   |
| GSM850  | GPRS  | 512     | 824.2   | 25.53      | 357.27 |
|         |       | 661     | 836.6   | 27.04      | 505.82 |
|         |       | 810     | 848.8   | 25.38      | 345.14 |
|         | EGPRS | 512     | 824.2   | 18.66      | 73.45  |
|         |       | 661     | 836.6   | 20.78      | 119.67 |
|         |       | 810     | 848.8   | 18.60      | 72.44  |
| GSM1900 | GPRS  | 512     | 1850.2  | 29.54      | 899.50 |
|         |       | 661     | 1880.0  | 29.66      | 924.70 |
|         |       | 810     | 1909.8  | 28.92      | 779.83 |
|         | EGPRS | 512     | 1850.2  | 26.06      | 403.65 |
|         |       | 661     | 1880.0  | 26.30      | 426.58 |
|         |       | 810     | 1909.8  | 25.26      | 335.74 |

#### WCDMA

| Band   | Mode  | Channel | f [MHz] | ERP / EIRP |        |
|--------|-------|---------|---------|------------|--------|
|        |       |         |         | [dBm]      | [mW]   |
| Band 5 | REL99 | 4132    | 826.4   | 17.93      | 62.09  |
|        |       | 4183    | 836.6   | 17.48      | 55.98  |
|        |       | 4233    | 846.6   | 16.64      | 46.13  |
|        | HSDPA | 4132    | 826.4   | 17.43      | 55.34  |
|        |       | 4183    | 836.6   | 17.09      | 51.17  |
|        |       | 4233    | 846.6   | 16.35      | 43.15  |
| Band 2 | REL99 | 9262    | 1852.4  | 21.40      | 138.04 |
|        |       | 9400    | 1880.0  | 21.31      | 135.21 |
|        |       | 9538    | 1907.6  | 20.99      | 125.60 |
|        | HSDPA | 9262    | 1852.4  | 19.88      | 97.27  |
|        |       | 9400    | 1880.0  | 20.43      | 110.41 |
|        |       | 9538    | 1907.6  | 19.87      | 97.05  |

**WCDMA**

| Band   | Mode  | Channel | f [MHz] | ERP / EIRP |        |
|--------|-------|---------|---------|------------|--------|
|        |       |         |         | [dBm]      | [mW]   |
| Band 4 | REL99 | 1312    | 1712.4  | 25.19      | 330.37 |
|        |       | 1413    | 1732.6  | 24.54      | 284.45 |
|        |       | 1513    | 1752.6  | 23.44      | 220.80 |
|        | HSDPA | 1312    | 1712.4  | 24.11      | 257.63 |
|        |       | 1413    | 1732.6  | 23.56      | 226.99 |
|        |       | 1513    | 1752.6  | 22.43      | 174.98 |

**LTE Band 5**

| Band   | BW [MHz] | Mode  | RB/RB Size | f [MHz] | ERP / EIRP |       |
|--------|----------|-------|------------|---------|------------|-------|
|        |          |       | Full RB    |         | [dBm]      | [mW]  |
| Band 5 | 10       | QPSK  | 50/0       | 829.0   | 16.32      | 42.85 |
|        |          |       | 50/0       | 836.5   | 16.02      | 39.99 |
|        |          |       | 50/0       | 844.0   | 15.57      | 36.06 |
|        |          | 16QAM | 50/0       | 829.0   | 15.50      | 35.48 |
|        |          |       | 50/0       | 836.5   | 15.05      | 31.99 |
|        |          |       | 50/0       | 844.0   | 14.39      | 27.48 |
|        | 5        | QPSK  | 25/0       | 826.5   | 16.08      | 40.55 |
|        |          |       | 25/0       | 836.5   | 15.69      | 37.07 |
|        |          |       | 25/0       | 846.5   | 14.76      | 29.92 |
|        |          | 16QAM | 25/0       | 826.5   | 15.07      | 32.14 |
|        |          |       | 25/0       | 836.5   | 14.77      | 29.99 |
|        |          |       | 25/0       | 846.5   | 13.83      | 24.15 |
|        | 3        | QPSK  | 15/0       | 825.5   | 16.45      | 44.16 |
|        |          |       | 15/0       | 836.5   | 15.57      | 36.06 |
|        |          |       | 15/0       | 847.5   | 14.48      | 28.05 |
|        |          | 16QAM | 15/0       | 825.5   | 15.42      | 34.83 |
|        |          |       | 15/0       | 836.5   | 14.59      | 28.77 |
|        |          |       | 15/0       | 847.5   | 13.51      | 22.44 |
|        | 1.4      | QPSK  | 6/0        | 824.7   | 13.98      | 25.00 |
|        |          |       | 6/0        | 836.5   | 12.45      | 17.58 |
|        |          |       | 6/0        | 848.3   | 12.33      | 17.10 |
|        |          | 16QAM | 6/0        | 824.7   | 13.14      | 20.61 |
|        |          |       | 6/0        | 836.5   | 11.51      | 14.16 |
|        |          |       | 6/0        | 848.3   | 11.40      | 13.80 |

### LTE Band 41

| Band    | BW [MHz] | Mode  | RB/RB Size | f [MHz] | ERP / EIRP |        |
|---------|----------|-------|------------|---------|------------|--------|
|         |          |       | Full RB    |         | [dBm]      | [mW]   |
| Band 41 | 20       | QPSK  | 100/0      | 2506.0  | 17.99      | 62.95  |
|         |          |       | 100/0      | 2593.0  | 18.79      | 75.68  |
|         |          |       | 100/0      | 2680.0  | 21.17      | 130.92 |
|         |          | 16QAM | 100/0      | 2506.0  | 17.00      | 50.12  |
|         |          |       | 100/0      | 2593.0  | 17.89      | 61.52  |
|         |          |       | 100/0      | 2680.0  | 20.24      | 105.68 |
|         | 15       | QPSK  | 75/0       | 2503.5  | 17.20      | 52.48  |
|         |          |       | 75/0       | 2593.0  | 18.40      | 69.18  |
|         |          |       | 75/0       | 2682.5  | 21.11      | 129.12 |
|         |          | 16QAM | 75/0       | 2503.5  | 16.46      | 44.26  |
|         |          |       | 75/0       | 2593.0  | 17.45      | 55.59  |
|         |          |       | 75/0       | 2682.5  | 20.66      | 116.41 |
|         | 10       | QPSK  | 50/0       | 2501.0  | 17.97      | 62.66  |
|         |          |       | 50/0       | 2593.0  | 16.51      | 44.77  |
|         |          |       | 50/0       | 2685.0  | 20.11      | 102.57 |
|         |          | 16QAM | 50/0       | 2501.0  | 17.00      | 50.12  |
|         |          |       | 50/0       | 2593.0  | 15.67      | 36.90  |
|         |          |       | 50/0       | 2685.0  | 18.85      | 76.74  |
|         | 5        | QPSK  | 25/0       | 2498.5  | 17.84      | 60.81  |
|         |          |       | 25/0       | 2593.0  | 18.79      | 75.68  |
|         |          |       | 25/0       | 2687.5  | 20.28      | 106.66 |
|         |          | 16QAM | 25/0       | 2498.5  | 17.23      | 52.84  |
|         |          |       | 25/0       | 2593.0  | 17.67      | 58.48  |
|         |          |       | 25/0       | 2687.5  | 19.29      | 84.92  |

### LTE Band 4

Due to frequency range and same output power setting, test was carried in LTE Band 66 to cover both LTE Band 66 and LTE Band 4.

### LTE Band 17

Due to frequency range and same output power setting, test was carried in LTE Band 12 to cover both LTE Band 12 and LTE Band 17.

**LTE Band 66**

| Band    | BW [MHz] | Mode  | RB/RB Size | f [MHz] | ERP / EIRP |        |
|---------|----------|-------|------------|---------|------------|--------|
|         |          |       | Full RB    |         | [dBm]      | [mW]   |
| Band 66 | 20       | QPSK  | 100/0      | 1720.0  | 22.96      | 197.70 |
|         |          |       | 100/0      | 1745.0  | 22.86      | 193.20 |
|         |          |       | 100/0      | 1770.0  | 21.59      | 144.21 |
|         |          | 16QAM | 100/0      | 1720.0  | 21.96      | 157.04 |
|         |          |       | 100/0      | 1745.0  | 22.15      | 164.06 |
|         |          |       | 100/0      | 1770.0  | 20.59      | 114.55 |
|         | 15       | QPSK  | 75/0       | 1717.5  | 23.23      | 210.38 |
|         |          |       | 75/0       | 1745.0  | 22.13      | 163.31 |
|         |          |       | 75/0       | 1772.5  | 22.13      | 163.31 |
|         |          | 16QAM | 75/0       | 1717.5  | 22.29      | 169.43 |
|         |          |       | 75/0       | 1745.0  | 21.37      | 137.09 |
|         |          |       | 75/0       | 1772.5  | 21.19      | 131.52 |
|         | 10       | QPSK  | 50/0       | 1715.0  | 22.21      | 166.34 |
|         |          |       | 50/0       | 1745.0  | 22.65      | 184.08 |
|         |          |       | 50/0       | 1775.0  | 21.45      | 139.64 |
|         |          | 16QAM | 50/0       | 1715.0  | 21.22      | 132.43 |
|         |          |       | 50/0       | 1745.0  | 21.61      | 144.88 |
|         |          |       | 50/0       | 1775.0  | 20.57      | 114.02 |
|         | 5        | QPSK  | 25/0       | 1712.5  | 23.23      | 210.38 |
|         |          |       | 25/0       | 1745.0  | 23.79      | 239.33 |
|         |          |       | 25/0       | 1777.5  | 23.68      | 233.35 |
|         |          | 16QAM | 25/0       | 1712.5  | 22.20      | 165.96 |
|         |          |       | 25/0       | 1745.0  | 22.75      | 188.36 |
|         |          |       | 25/0       | 1777.5  | 22.50      | 177.83 |
|         | 3        | QPSK  | 15/0       | 1711.5  | 23.36      | 216.77 |
|         |          |       | 15/0       | 1745.0  | 23.75      | 237.14 |
|         |          |       | 15/0       | 1778.5  | 21.38      | 137.40 |
|         |          | 16QAM | 15/0       | 1711.5  | 22.38      | 172.98 |
|         |          |       | 15/0       | 1745.0  | 22.74      | 187.93 |
|         |          |       | 15/0       | 1778.5  | 20.36      | 108.64 |
|         | 1.4      | QPSK  | 6/0        | 1710.7  | 19.58      | 90.78  |
|         |          |       | 6/0        | 1745.0  | 21.31      | 135.21 |
|         |          |       | 6/0        | 1779.3  | 19.25      | 84.14  |
|         |          | 16QAM | 6/0        | 1710.7  | 18.62      | 72.78  |
|         |          |       | 6/0        | 1745.0  | 20.22      | 105.20 |
|         |          |       | 6/0        | 1779.3  | 18.28      | 67.30  |

**LTE Band 2**

| Band   | BW [MHz] | Mode  | RB/RB Size | f [MHz] | ERP / EIRP |        |
|--------|----------|-------|------------|---------|------------|--------|
|        |          |       | Full RB    |         | [dBm]      | [mW]   |
| Band 2 | 20       | QPSK  | 100/0      | 1860.0  | 19.48      | 88.72  |
|        |          |       | 100/0      | 1880.0  | 19.47      | 88.51  |
|        |          |       | 100/0      | 1900.0  | 19.55      | 90.16  |
|        |          | 16QAM | 100/0      | 1860.0  | 18.49      | 70.63  |
|        |          |       | 100/0      | 1880.0  | 18.40      | 69.18  |
|        |          |       | 100/0      | 1900.0  | 18.54      | 71.45  |
|        | 15       | QPSK  | 75/0       | 1857.5  | 18.35      | 68.39  |
|        |          |       | 75/0       | 1880.0  | 19.80      | 95.50  |
|        |          |       | 75/0       | 1902.5  | 18.88      | 77.27  |
|        |          | 16QAM | 75/0       | 1857.5  | 17.47      | 55.85  |
|        |          |       | 75/0       | 1880.0  | 18.82      | 76.21  |
|        |          |       | 75/0       | 1902.5  | 17.88      | 61.38  |
|        | 10       | QPSK  | 50/0       | 1855.0  | 20.20      | 104.71 |
|        |          |       | 50/0       | 1880.0  | 19.71      | 93.54  |
|        |          |       | 50/0       | 1905.0  | 19.26      | 84.33  |
|        |          | 16QAM | 50/0       | 1855.0  | 19.16      | 82.41  |
|        |          |       | 50/0       | 1880.0  | 18.67      | 73.62  |
|        |          |       | 50/0       | 1905.0  | 18.21      | 66.22  |
|        | 5        | QPSK  | 25/0       | 1852.5  | 19.77      | 94.84  |
|        |          |       | 25/0       | 1880.0  | 20.18      | 104.23 |
|        |          |       | 25/0       | 1907.5  | 18.96      | 78.70  |
|        |          | 16QAM | 25/0       | 1852.5  | 18.80      | 75.86  |
|        |          |       | 25/0       | 1880.0  | 19.17      | 82.60  |
|        |          |       | 25/0       | 1907.5  | 17.97      | 62.66  |
|        | 3        | QPSK  | 15/0       | 1851.5  | 20.11      | 102.57 |
|        |          |       | 15/0       | 1880.0  | 18.08      | 64.27  |
|        |          |       | 15/0       | 1908.5  | 19.29      | 84.92  |
|        |          | 16QAM | 15/0       | 1851.5  | 19.06      | 80.54  |
|        |          |       | 15/0       | 1880.0  | 17.06      | 50.82  |
|        |          |       | 15/0       | 1908.5  | 18.26      | 66.99  |
|        | 1.4      | QPSK  | 6/0        | 1850.7  | 17.26      | 53.21  |
|        |          |       | 6/0        | 1880.0  | 18.38      | 68.87  |
|        |          |       | 6/0        | 1909.3  | 16.56      | 45.29  |
|        |          | 16QAM | 6/0        | 1850.7  | 16.23      | 41.98  |
|        |          |       | 6/0        | 1880.0  | 17.41      | 55.08  |
|        |          |       | 6/0        | 1909.3  | 15.59      | 36.22  |

**LTE Band 13**

| Band    | BW [MHz] | Mode  | RB/RB Size | f [MHz] | ERP / EIRP |       |
|---------|----------|-------|------------|---------|------------|-------|
|         |          |       | Full RB    |         | [dBm]      | [mW]  |
| Band 13 | 10       | QPSK  | 50/0       | 782.0   | 13.13      | 20.56 |
|         |          | 16QAM | 50/0       | 782.0   | 12.22      | 16.67 |
|         | 5        | QPSK  | 25/0       | 779.5   | 14.22      | 26.42 |
|         |          |       | 25/0       | 782.0   | 14.12      | 25.82 |
|         |          |       | 25/0       | 784.5   | 14.27      | 26.73 |
|         |          | 16QAM | 25/0       | 779.5   | 13.13      | 20.56 |
|         |          |       | 25/0       | 782.0   | 13.06      | 20.23 |
|         |          |       | 25/0       | 784.5   | 14.07      | 25.53 |
|         |          |       | 25/0       | 784.5   | 14.07      | 25.53 |

**LTE Band 12**

| Band    | BW [MHz] | Mode  | RB/RB Size | f [MHz] | ERP / EIRP |       |
|---------|----------|-------|------------|---------|------------|-------|
|         |          |       | Full RB    |         | [dBm]      | [mW]  |
| Band 12 | 10       | QPSK  | 50/0       | 704.0   | 15.79      | 37.93 |
|         |          |       | 50/0       | 707.5   | 15.86      | 38.55 |
|         |          |       | 50/0       | 711.0   | 16.08      | 40.55 |
|         |          | 16QAM | 50/0       | 704.0   | 14.80      | 30.20 |
|         |          |       | 50/0       | 707.5   | 14.82      | 30.34 |
|         |          |       | 50/0       | 711.0   | 14.99      | 31.55 |
|         | 5        | QPSK  | 25/0       | 701.5   | 15.34      | 34.20 |
|         |          |       | 25/0       | 707.5   | 15.44      | 34.99 |
|         |          |       | 25/0       | 713.5   | 15.00      | 31.62 |
|         |          | 16QAM | 25/0       | 701.5   | 14.30      | 26.92 |
|         |          |       | 25/0       | 707.5   | 14.54      | 28.44 |
|         |          |       | 25/0       | 713.5   | 14.11      | 25.76 |
|         | 3        | QPSK  | 15/0       | 700.5   | 15.21      | 33.19 |
|         |          |       | 15/0       | 707.5   | 15.45      | 35.08 |
|         |          |       | 15/0       | 714.5   | 15.61      | 36.39 |
|         |          | 16QAM | 15/0       | 700.5   | 14.16      | 26.06 |
|         |          |       | 15/0       | 707.5   | 14.41      | 27.61 |
|         |          |       | 15/0       | 714.5   | 14.92      | 31.05 |
|         | 1.4      | QPSK  | 6/0        | 699.7   | 12.73      | 18.75 |
|         |          |       | 6/0        | 707.5   | 13.15      | 20.65 |
|         |          |       | 6/0        | 715.3   | 13.03      | 20.09 |
|         |          | 16QAM | 6/0        | 699.7   | 11.78      | 15.07 |
|         |          |       | 6/0        | 707.5   | 12.09      | 16.18 |
|         |          |       | 6/0        | 715.3   | 11.91      | 15.52 |

## 10.1.2. ERP/EIRP DATA

### GSM 850

|                       |                                                                           |                     |                           |                    |                       |              |                |               |       |
|-----------------------|---------------------------------------------------------------------------|---------------------|---------------------------|--------------------|-----------------------|--------------|----------------|---------------|-------|
| GSM<br>GSM850<br>GPRS | UL Verification Services, Inc.<br>High Frequency Substitution Measurement |                     |                           |                    |                       |              |                |               |       |
|                       | Company:                                                                  |                     | Samsung                   |                    |                       |              |                |               |       |
|                       | Project #:                                                                |                     | 4788372835                |                    |                       |              |                |               |       |
|                       | Date:                                                                     |                     | 2018-03-19                |                    |                       |              |                |               |       |
|                       | Test Engineer:                                                            |                     | 47989                     |                    |                       |              |                |               |       |
|                       | Configuration:                                                            |                     | EUT / X-Position          |                    |                       |              |                |               |       |
|                       | Location:                                                                 |                     | Chamber 1                 |                    |                       |              |                |               |       |
|                       | Mode:                                                                     |                     | GPRS 850 MHz Fundamentals |                    |                       |              |                |               |       |
|                       | Test Equipment:                                                           |                     |                           |                    |                       |              |                |               |       |
|                       | Receiving: VULB9163-845, and Chamber 2 SMA Cables                         |                     |                           |                    |                       |              |                |               |       |
|                       | Substitution: Dipole 3121_DB4, 3m N-type Cable                            |                     |                           |                    |                       |              |                |               |       |
|                       | f<br>MHz                                                                  | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)        | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|                       | Low Ch                                                                    |                     |                           |                    |                       |              |                |               |       |
|                       | 824.20                                                                    | 21.21               | V                         | 1.0                | -1.5                  | 18.78        | 38.5           | -19.7         |       |
|                       | 824.20                                                                    | 27.96               | H                         | 1.0                | -1.5                  | 25.53        | 38.5           | -13.0         |       |
| Mid Ch                |                                                                           |                     |                           |                    |                       |              |                |               |       |
| 836.60                | 22.14                                                                     | V                   | 1.0                       | -1.4               | 19.76                 | 38.5         | -18.7          |               |       |
| 836.60                | 29.42                                                                     | H                   | 1.0                       | -1.4               | 27.04                 | 38.5         | -11.5          |               |       |
| High Ch               |                                                                           |                     |                           |                    |                       |              |                |               |       |
| 848.80                | 20.65                                                                     | V                   | 1.0                       | -1.4               | 18.31                 | 38.5         | -20.2          |               |       |
| 848.80                | 27.72                                                                     | H                   | 1.0                       | -1.4               | 25.38                 | 38.5         | -13.1          |               |       |
|                       |                                                                           |                     |                           |                    |                       |              |                |               |       |

|                        |                                                                           |                     |                            |                    |                       |              |                |               |       |
|------------------------|---------------------------------------------------------------------------|---------------------|----------------------------|--------------------|-----------------------|--------------|----------------|---------------|-------|
| GSM<br>GSM850<br>EGPRS | UL Verification Services, Inc.<br>High Frequency Substitution Measurement |                     |                            |                    |                       |              |                |               |       |
|                        | Company:                                                                  |                     | Samsung                    |                    |                       |              |                |               |       |
|                        | Project #:                                                                |                     | 4788372835                 |                    |                       |              |                |               |       |
|                        | Date:                                                                     |                     | 2018-03-19                 |                    |                       |              |                |               |       |
|                        | Test Engineer:                                                            |                     | 47989                      |                    |                       |              |                |               |       |
|                        | Configuration:                                                            |                     | EUT / X-Position           |                    |                       |              |                |               |       |
|                        | Location:                                                                 |                     | Chamber 1                  |                    |                       |              |                |               |       |
|                        | Mode:                                                                     |                     | EGPRS 850 MHz Fundamentals |                    |                       |              |                |               |       |
|                        | Test Equipment:                                                           |                     |                            |                    |                       |              |                |               |       |
|                        | Receiving: VULB9163-845, and Chamber 2 SMA Cables                         |                     |                            |                    |                       |              |                |               |       |
|                        | Substitution: Dipole 3121_DB4, 3m N-type Cable                            |                     |                            |                    |                       |              |                |               |       |
|                        | f<br>MHz                                                                  | SG reading<br>(dBm) | Ant. Pol.<br>(H/V)         | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|                        | Low Ch                                                                    |                     |                            |                    |                       |              |                |               |       |
|                        | 824.20                                                                    | 15.29               | V                          | 1.0                | -1.5                  | 12.86        | 38.5           | -25.6         |       |
|                        | 824.20                                                                    | 21.09               | H                          | 1.0                | -1.5                  | 18.66        | 38.5           | -19.8         |       |
| Mid Ch                 |                                                                           |                     |                            |                    |                       |              |                |               |       |
| 836.60                 | 15.83                                                                     | V                   | 1.0                        | -1.4               | 13.45                 | 38.5         | -25.1          |               |       |
| 836.60                 | 23.16                                                                     | H                   | 1.0                        | -1.4               | 20.78                 | 38.5         | -17.7          |               |       |
| High Ch                |                                                                           |                     |                            |                    |                       |              |                |               |       |
| 848.80                 | 14.08                                                                     | V                   | 1.0                        | -1.4               | 11.74                 | 38.5         | -26.8          |               |       |
| 848.80                 | 20.94                                                                     | H                   | 1.0                        | -1.4               | 18.60                 | 38.5         | -19.9          |               |       |
|                        |                                                                           |                     |                            |                    |                       |              |                |               |       |

**GSM 1900**

| GSM<br><br>GSM1900<br>GPRS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | UL Verification Services, Inc.<br>High Frequency Substitution Measurement                                      |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------|-----------------------|---------------|----------------|---------------|-------|----------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|------|--|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Company:                                                                                                       |                    | Samsung                     |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Project #:                                                                                                     |                    | 4788372835                  |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Date:                                                                                                          |                    | 2018-02-25                  |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Test Engineer:                                                                                                 |                    | 45585                       |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Configuration:                                                                                                 |                    | EUT / Z-Position            |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Location:                                                                                                      |                    | Chamber 1                   |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Mode:                                                                                                          |                    | GPRS 1900 MHz Fundamentals  |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Test Equipment:                                                                                                |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br>Substitution: Horn 3115[00161451], 3m N-type Cable |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1850.20</td><td>17.10</td><td>V</td><td>4.5</td><td>9.5</td><td>22.11</td><td>33.0</td><td>-10.9</td><td></td></tr><tr><td>1850.20</td><td>24.53</td><td>H</td><td>4.5</td><td>9.5</td><td>29.54</td><td>33.0</td><td>-3.5</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1880.00</td><td>18.02</td><td>V</td><td>4.5</td><td>9.2</td><td>22.70</td><td>33.0</td><td>-10.3</td><td></td></tr><tr><td>1880.00</td><td>24.98</td><td>H</td><td>4.5</td><td>9.2</td><td>29.66</td><td>33.0</td><td>-3.3</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1909.80</td><td>19.01</td><td>V</td><td>4.6</td><td>8.9</td><td>23.31</td><td>33.0</td><td>-9.7</td><td></td></tr><tr><td>1909.80</td><td>24.62</td><td>H</td><td>4.6</td><td>8.9</td><td>28.92</td><td>33.0</td><td>-4.1</td><td></td></tr></table>  |                                                                                                                |                    |                             |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1850.20 | 17.10 | V | 4.5 | 9.5 | 22.11 | 33.0 | -10.9 |  | 1850.20 | 24.53 | H | 4.5 | 9.5 | 29.54 | 33.0 | -3.5 |  | Mid Ch |  |  |  |  |  |  |  |  | 1880.00 | 18.02 | V | 4.5 | 9.2 | 22.70 | 33.0 | -10.3 |  | 1880.00 | 24.98 | H | 4.5 | 9.2 | 29.66 | 33.0 | -3.3 |  | High Ch |  |  |  |  |  |  |  |  | 1909.80 | 19.01 | V | 4.6 | 8.9 | 23.31 | 33.0 | -9.7  |  | 1909.80 | 24.62 | H | 4.6 | 8.9 | 28.92 | 33.0 | -4.1 |  |
| f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SG reading<br>(dBm)                                                                                            | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB)          | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1850.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 17.10                                                                                                          | V                  | 4.5                         | 9.5                   | 22.11         | 33.0           | -10.9         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1850.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 24.53                                                                                                          | H                  | 4.5                         | 9.5                   | 29.54         | 33.0           | -3.5          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 18.02                                                                                                          | V                  | 4.5                         | 9.2                   | 22.70         | 33.0           | -10.3         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 24.98                                                                                                          | H                  | 4.5                         | 9.2                   | 29.66         | 33.0           | -3.3          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1909.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 19.01                                                                                                          | V                  | 4.6                         | 8.9                   | 23.31         | 33.0           | -9.7          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1909.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 24.62                                                                                                          | H                  | 4.6                         | 8.9                   | 28.92         | 33.0           | -4.1          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| GSM<br><br>GSM1900<br>EGPRS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | UL Verification Services, Inc.<br>High Frequency Substitution Measurement                                      |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Company:                                                                                                       |                    | Samsung                     |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Project #:                                                                                                     |                    | 4788372835                  |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Date:                                                                                                          |                    | 2018-02-25                  |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Test Engineer:                                                                                                 |                    | 45585                       |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Configuration:                                                                                                 |                    | EUT / Z-Position            |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Location:                                                                                                      |                    | Chamber 1                   |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Mode:                                                                                                          |                    | EGPRS 1900 MHz Fundamentals |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Test Equipment:                                                                                                |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br>Substitution: Horn 3115[00161451], 3m N-type Cable |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1850.20</td><td>13.32</td><td>V</td><td>4.5</td><td>9.5</td><td>18.33</td><td>33.0</td><td>-14.7</td><td></td></tr><tr><td>1850.20</td><td>21.05</td><td>H</td><td>4.5</td><td>9.5</td><td>26.06</td><td>33.0</td><td>-6.9</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1880.00</td><td>14.57</td><td>V</td><td>4.5</td><td>9.2</td><td>19.25</td><td>33.0</td><td>-13.8</td><td></td></tr><tr><td>1880.00</td><td>21.62</td><td>H</td><td>4.5</td><td>9.2</td><td>26.30</td><td>33.0</td><td>-6.7</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1909.80</td><td>15.23</td><td>V</td><td>4.6</td><td>8.9</td><td>19.53</td><td>33.0</td><td>-13.5</td><td></td></tr><tr><td>1909.80</td><td>20.96</td><td>H</td><td>4.6</td><td>8.9</td><td>25.26</td><td>33.0</td><td>-7.7</td><td></td></tr></table> |                                                                                                                |                    |                             |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1850.20 | 13.32 | V | 4.5 | 9.5 | 18.33 | 33.0 | -14.7 |  | 1850.20 | 21.05 | H | 4.5 | 9.5 | 26.06 | 33.0 | -6.9 |  | Mid Ch |  |  |  |  |  |  |  |  | 1880.00 | 14.57 | V | 4.5 | 9.2 | 19.25 | 33.0 | -13.8 |  | 1880.00 | 21.62 | H | 4.5 | 9.2 | 26.30 | 33.0 | -6.7 |  | High Ch |  |  |  |  |  |  |  |  | 1909.80 | 15.23 | V | 4.6 | 8.9 | 19.53 | 33.0 | -13.5 |  | 1909.80 | 20.96 | H | 4.6 | 8.9 | 25.26 | 33.0 | -7.7 |  |
| f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SG reading<br>(dBm)                                                                                            | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB)          | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1850.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 13.32                                                                                                          | V                  | 4.5                         | 9.5                   | 18.33         | 33.0           | -14.7         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1850.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 21.05                                                                                                          | H                  | 4.5                         | 9.5                   | 26.06         | 33.0           | -6.9          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 14.57                                                                                                          | V                  | 4.5                         | 9.2                   | 19.25         | 33.0           | -13.8         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 21.62                                                                                                          | H                  | 4.5                         | 9.2                   | 26.30         | 33.0           | -6.7          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1909.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 15.23                                                                                                          | V                  | 4.6                         | 8.9                   | 19.53         | 33.0           | -13.5         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1909.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 20.96                                                                                                          | H                  | 4.6                         | 8.9                   | 25.26         | 33.0           | -7.7          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |

**WCDMA Band 5**

| WCDMA<br><br>Band 5<br>REL99 | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4788372835<br/>Date: 2018-02-25<br/>Test Engineer: 45585<br/>Configuration: EUT / X-Position<br/>Location: Chamber 1<br/>Mode: Rel99 Band 5 Fundamentals</div> <div>Test Equipment:<br/>Receiving: VULB9163-845, and Chamber 2 SMA Cables<br/>Substitution: Dipole 3121_DB4, 3m N-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBd)</th><th>ERP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>826.40</td><td>10.30</td><td>V</td><td>1.0</td><td>-1.5</td><td>7.88</td><td>38.5</td><td>-30.6</td></tr><tr><td>826.40</td><td>20.35</td><td>H</td><td>1.0</td><td>-1.5</td><td>17.93</td><td>38.5</td><td>-20.6</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>836.60</td><td>10.34</td><td>V</td><td>1.0</td><td>-1.4</td><td>7.96</td><td>38.5</td><td>-30.5</td></tr><tr><td>836.60</td><td>19.86</td><td>H</td><td>1.0</td><td>-1.4</td><td>17.48</td><td>38.5</td><td>-21.0</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>846.60</td><td>9.87</td><td>V</td><td>1.0</td><td>-1.4</td><td>7.52</td><td>38.5</td><td>-31.0</td></tr><tr><td>846.60</td><td>18.99</td><td>H</td><td>1.0</td><td>-1.4</td><td>16.64</td><td>38.5</td><td>-21.9</td></tr></table> |                     |                    |                    |                       |              |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  | 826.40 | 10.30 | V | 1.0 | -1.5 | 7.88 | 38.5 | -30.6 | 826.40 | 20.35 | H | 1.0 | -1.5 | 17.93 | 38.5 | -20.6 | Mid Ch |  |  |  |  |  |  |  | 836.60 | 10.34 | V | 1.0 | -1.4 | 7.96 | 38.5 | -30.5 | 836.60 | 19.86 | H | 1.0 | -1.4 | 17.48 | 38.5 | -21.0 | High Ch |  |  |  |  |  |  |  | 846.60 | 9.87 | V | 1.0 | -1.4 | 7.52 | 38.5 | -31.0 | 846.60 | 18.99 | H | 1.0 | -1.4 | 16.64 | 38.5 | -21.9 |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|---------------|-------|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|---------------|-------|--------|--|--|--|--|--|--|--|--------|-------|---|-----|------|------|------|-------|--------|-------|---|-----|------|-------|------|-------|--------|--|--|--|--|--|--|--|--------|-------|---|-----|------|------|------|-------|--------|-------|---|-----|------|-------|------|-------|---------|--|--|--|--|--|--|--|--------|------|---|-----|------|------|------|-------|--------|-------|---|-----|------|-------|------|-------|
|                              | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
|                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                     |                    |                    |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
|                              | 826.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 10.30               | V                  | 1.0                | -1.5                  | 7.88         | 38.5           | -30.6         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
|                              | 826.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 20.35               | H                  | 1.0                | -1.5                  | 17.93        | 38.5           | -20.6         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
|                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                     |                    |                    |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
|                              | 836.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 10.34               | V                  | 1.0                | -1.4                  | 7.96         | 38.5           | -30.5         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
|                              | 836.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 19.86               | H                  | 1.0                | -1.4                  | 17.48        | 38.5           | -21.0         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
|                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |                    |                    |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
|                              | 846.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 9.87                | V                  | 1.0                | -1.4                  | 7.52         | 38.5           | -31.0         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
| 846.60                       | 18.99                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H                   | 1.0                | -1.4               | 16.64                 | 38.5         | -21.9          |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
| WCDMA<br><br>Band 5<br>HSDPA | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4788372835<br/>Date: 2018-02-25<br/>Test Engineer: 45585<br/>Configuration: EUT / X-Position<br/>Location: Chamber 1<br/>Mode: HSDPA Band 5 Fundamentals</div> <div>Test Equipment:<br/>Receiving: VULB9163-845, and Chamber 2 SMA Cables<br/>Substitution: Dipole 3121_DB4, 3m N-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBd)</th><th>ERP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>826.40</td><td>10.10</td><td>V</td><td>1.0</td><td>-1.5</td><td>7.68</td><td>38.5</td><td>-30.8</td></tr><tr><td>826.40</td><td>19.85</td><td>H</td><td>1.0</td><td>-1.5</td><td>17.43</td><td>38.5</td><td>-21.1</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>836.60</td><td>9.78</td><td>V</td><td>1.0</td><td>-1.4</td><td>7.40</td><td>38.5</td><td>-31.1</td></tr><tr><td>836.60</td><td>19.47</td><td>H</td><td>1.0</td><td>-1.4</td><td>17.09</td><td>38.5</td><td>-21.4</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>846.60</td><td>9.28</td><td>V</td><td>1.0</td><td>-1.4</td><td>6.93</td><td>38.5</td><td>-31.6</td></tr><tr><td>846.60</td><td>18.70</td><td>H</td><td>1.0</td><td>-1.4</td><td>16.35</td><td>38.5</td><td>-22.1</td></tr></table>  |                     |                    |                    |                       |              |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  | 826.40 | 10.10 | V | 1.0 | -1.5 | 7.68 | 38.5 | -30.8 | 826.40 | 19.85 | H | 1.0 | -1.5 | 17.43 | 38.5 | -21.1 | Mid Ch |  |  |  |  |  |  |  | 836.60 | 9.78  | V | 1.0 | -1.4 | 7.40 | 38.5 | -31.1 | 836.60 | 19.47 | H | 1.0 | -1.4 | 17.09 | 38.5 | -21.4 | High Ch |  |  |  |  |  |  |  | 846.60 | 9.28 | V | 1.0 | -1.4 | 6.93 | 38.5 | -31.6 | 846.60 | 18.70 | H | 1.0 | -1.4 | 16.35 | 38.5 | -22.1 |
|                              | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
|                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                     |                    |                    |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
|                              | 826.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 10.10               | V                  | 1.0                | -1.5                  | 7.68         | 38.5           | -30.8         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
|                              | 826.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 19.85               | H                  | 1.0                | -1.5                  | 17.43        | 38.5           | -21.1         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
|                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                     |                    |                    |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
|                              | 836.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 9.78                | V                  | 1.0                | -1.4                  | 7.40         | 38.5           | -31.1         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
|                              | 836.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 19.47               | H                  | 1.0                | -1.4                  | 17.09        | 38.5           | -21.4         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
|                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |                    |                    |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
|                              | 846.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 9.28                | V                  | 1.0                | -1.4                  | 6.93         | 38.5           | -31.6         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |
| 846.60                       | 18.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H                   | 1.0                | -1.4               | 16.35                 | 38.5         | -22.1          |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |        |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |        |      |   |     |      |      |      |       |        |       |   |     |      |       |      |       |

**WCDMA Band 4**

| WCDMA<br><br>Band 4<br>REL99 | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4788388893<br/>Date: 2018-03-24<br/>Test Engineer: 51072<br/>Configuration: EUT / X-Postition<br/>Location: Chamber 2<br/>Mode: Rel99 Band 4 Fundamentals</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00161451], 3m N-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1712.40</td><td>13.48</td><td>V</td><td>4.3</td><td>9.5</td><td>18.63</td><td>30.0</td><td>-11.4</td></tr><tr><td>1712.40</td><td>20.04</td><td>H</td><td>4.3</td><td>9.5</td><td>25.19</td><td>30.0</td><td>-4.8</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1732.60</td><td>17.25</td><td>V</td><td>4.3</td><td>9.5</td><td>22.45</td><td>30.0</td><td>-7.6</td></tr><tr><td>1732.60</td><td>19.35</td><td>H</td><td>4.3</td><td>9.5</td><td>24.54</td><td>30.0</td><td>-5.5</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1752.60</td><td>13.12</td><td>V</td><td>4.4</td><td>9.6</td><td>18.36</td><td>30.0</td><td>-11.6</td></tr><tr><td>1752.60</td><td>18.20</td><td>H</td><td>4.4</td><td>9.6</td><td>23.44</td><td>30.0</td><td>-6.6</td></tr></table> |                     |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  | 1712.40 | 13.48 | V | 4.3 | 9.5 | 18.63 | 30.0 | -11.4 | 1712.40 | 20.04 | H | 4.3 | 9.5 | 25.19 | 30.0 | -4.8 | Mid Ch |  |  |  |  |  |  |  | 1732.60 | 17.25 | V | 4.3 | 9.5 | 22.45 | 30.0 | -7.6 | 1732.60 | 19.35 | H | 4.3 | 9.5 | 24.54 | 30.0 | -5.5 | High Ch |  |  |  |  |  |  |  | 1752.60 | 13.12 | V | 4.4 | 9.6 | 18.36 | 30.0 | -11.6 | 1752.60 | 18.20 | H | 4.4 | 9.6 | 23.44 | 30.0 | -6.6 |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|----------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|--------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|------|--------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|------|---------|-------|---|-----|-----|-------|------|------|---------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|------|
|                              | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1712.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 13.48               | V                  | 4.3                | 9.5                   | 18.63         | 30.0           | -11.4         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1712.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 20.04               | H                  | 4.3                | 9.5                   | 25.19         | 30.0           | -4.8          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1732.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 17.25               | V                  | 4.3                | 9.5                   | 22.45         | 30.0           | -7.6          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1732.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 19.35               | H                  | 4.3                | 9.5                   | 24.54         | 30.0           | -5.5          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1752.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 13.12               | V                  | 4.4                | 9.6                   | 18.36         | 30.0           | -11.6         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
| 1752.60                      | 18.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | H                   | 4.4                | 9.6                | 23.44                 | 30.0          | -6.6           |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
| WCDMA<br><br>Band 4<br>HSDPA | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4788388893<br/>Date: 2018-03-24<br/>Test Engineer: 51072<br/>Configuration: EUT / X-Postition<br/>Location: Chamber 2<br/>Mode: HSDPA Band 4 Fundamentals</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00161451], 3m N-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1712.40</td><td>12.48</td><td>V</td><td>4.3</td><td>9.5</td><td>17.63</td><td>30.0</td><td>-12.4</td></tr><tr><td>1712.40</td><td>18.96</td><td>H</td><td>4.3</td><td>9.5</td><td>24.11</td><td>30.0</td><td>-5.9</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1732.60</td><td>16.15</td><td>V</td><td>4.3</td><td>9.5</td><td>21.35</td><td>30.0</td><td>-8.7</td></tr><tr><td>1732.60</td><td>18.37</td><td>H</td><td>4.3</td><td>9.5</td><td>23.56</td><td>30.0</td><td>-6.4</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1752.60</td><td>12.05</td><td>V</td><td>4.4</td><td>9.6</td><td>17.29</td><td>30.0</td><td>-12.7</td></tr><tr><td>1752.60</td><td>17.19</td><td>H</td><td>4.4</td><td>9.6</td><td>22.43</td><td>30.0</td><td>-7.6</td></tr></table> |                     |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  | 1712.40 | 12.48 | V | 4.3 | 9.5 | 17.63 | 30.0 | -12.4 | 1712.40 | 18.96 | H | 4.3 | 9.5 | 24.11 | 30.0 | -5.9 | Mid Ch |  |  |  |  |  |  |  | 1732.60 | 16.15 | V | 4.3 | 9.5 | 21.35 | 30.0 | -8.7 | 1732.60 | 18.37 | H | 4.3 | 9.5 | 23.56 | 30.0 | -6.4 | High Ch |  |  |  |  |  |  |  | 1752.60 | 12.05 | V | 4.4 | 9.6 | 17.29 | 30.0 | -12.7 | 1752.60 | 17.19 | H | 4.4 | 9.6 | 22.43 | 30.0 | -7.6 |
|                              | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1712.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 12.48               | V                  | 4.3                | 9.5                   | 17.63         | 30.0           | -12.4         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1712.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 18.96               | H                  | 4.3                | 9.5                   | 24.11         | 30.0           | -5.9          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1732.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 16.15               | V                  | 4.3                | 9.5                   | 21.35         | 30.0           | -8.7          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1732.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 18.37               | H                  | 4.3                | 9.5                   | 23.56         | 30.0           | -6.4          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
|                              | 1752.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 12.05               | V                  | 4.4                | 9.6                   | 17.29         | 30.0           | -12.7         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |
| 1752.60                      | 17.19                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | H                   | 4.4                | 9.6                | 22.43                 | 30.0          | -7.6           |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |      |         |       |   |     |     |       |      |      |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |      |

**WCDMA Band 2**

WCDMA

Band 2

REL99

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Samsung

Project #:

4788372835

Date:

2018-02-25

Test Engineer:

45585

Configuration:

EUT / Z-Position

Location:

Chamber 1

Mode:

Rel99 Band 2 Fundamentals

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00161451], 3m N-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| Low Ch   |                     |                    |                    |                       |               |                |               |       |
| 1852.40  | 9.39                | V                  | 4.5                | 9.5                   | 14.38         | 33.0           | -18.6         |       |
| 1852.40  | 16.41               | H                  | 4.5                | 9.5                   | 21.40         | 33.0           | -11.6         |       |
| Mid Ch   |                     |                    |                    |                       |               |                |               |       |
| 1880.00  | 10.72               | V                  | 4.5                | 9.2                   | 15.40         | 33.0           | -17.6         |       |
| 1880.00  | 16.63               | H                  | 4.5                | 9.2                   | 21.31         | 33.0           | -11.7         |       |
| High Ch  |                     |                    |                    |                       |               |                |               |       |
| 1907.60  | 10.09               | V                  | 4.6                | 8.9                   | 14.43         | 33.0           | -18.6         |       |
| 1907.60  | 16.65               | H                  | 4.6                | 8.9                   | 20.99         | 33.0           | -12.0         |       |

WCDMA

Band 2

HSDPA

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Samsung

Project #:

4788372835

Date:

2018-02-25

Test Engineer:

45585

Configuration:

EUT / Z-Position

Location:

Chamber 1

Mode:

HSDPA Band 2 Fundamentals

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00161451], 3m N-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| Low Ch   |                     |                    |                    |                       |               |                |               |       |
| 1852.40  | 8.28                | V                  | 4.5                | 9.5                   | 13.27         | 33.0           | -19.7         |       |
| 1852.40  | 14.89               | H                  | 4.5                | 9.5                   | 19.88         | 33.0           | -13.1         |       |
| Mid Ch   |                     |                    |                    |                       |               |                |               |       |
| 1880.00  | 9.69                | V                  | 4.5                | 9.2                   | 14.37         | 33.0           | -18.6         |       |
| 1880.00  | 15.75               | H                  | 4.5                | 9.2                   | 20.43         | 33.0           | -12.6         |       |
| High Ch  |                     |                    |                    |                       |               |                |               |       |
| 1907.60  | 9.46                | V                  | 4.6                | 8.9                   | 13.80         | 33.0           | -19.2         |       |
| 1907.60  | 15.53               | H                  | 4.6                | 8.9                   | 19.87         | 33.0           | -13.1         |       |

**LTE Band 5**

| LTE<br><br>Band 5<br><br>10MHz<br><br>QPSK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | UL Verification Services, Inc.<br>High Frequency Substitution Measurement |                    |                                                |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------|------------------------------------------------|-----------------------|--------------|----------------|---------------|-------|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|---------------|-------|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Company:                                                                  |                    | Samsung                                        |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Project #:                                                                |                    | 4788372835                                     |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Date:                                                                     |                    | 2018-03-19                                     |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Test Engineer:                                                            |                    | 47989                                          |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Configuration:                                                            |                    | EUT / X-Position                               |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Location:                                                                 |                    | Chamber 1                                      |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Mode:                                                                     |                    | LTE_QPSK Band 5 Fundamentals, 10MHz Bandwidth  |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Test Equipment:                                                           |                    |                                                |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Receiving: VULB9163-845, and Chamber 2 SMA Cables                         |                    |                                                |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| Substitution: Dipole 3121_DB4, 3m N-type Cable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                           |                    |                                                |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBd)</th><th>ERP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>829.00</td><td>12.21</td><td>V</td><td>1.0</td><td>-1.5</td><td>9.80</td><td>38.5</td><td>-28.7</td><td></td></tr><tr><td>829.00</td><td>18.73</td><td>H</td><td>1.0</td><td>-1.5</td><td>16.32</td><td>38.5</td><td>-22.2</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>836.50</td><td>11.17</td><td>V</td><td>1.0</td><td>-1.4</td><td>8.79</td><td>38.5</td><td>-29.7</td><td></td></tr><tr><td>836.50</td><td>18.40</td><td>H</td><td>1.0</td><td>-1.4</td><td>16.02</td><td>38.5</td><td>-22.5</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>844.00</td><td>10.75</td><td>V</td><td>1.0</td><td>-1.4</td><td>8.39</td><td>38.5</td><td>-30.1</td><td></td></tr><tr><td>844.00</td><td>17.92</td><td>H</td><td>1.0</td><td>-1.4</td><td>15.57</td><td>38.5</td><td>-22.9</td><td></td></tr></table> |                                                                           |                    |                                                |                       |              |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 829.00 | 12.21 | V | 1.0 | -1.5 | 9.80 | 38.5 | -28.7 |  | 829.00 | 18.73 | H | 1.0 | -1.5 | 16.32 | 38.5 | -22.2 |  | Mid Ch |  |  |  |  |  |  |  |  | 836.50 | 11.17 | V | 1.0 | -1.4 | 8.79 | 38.5 | -29.7 |  | 836.50 | 18.40 | H | 1.0 | -1.4 | 16.02 | 38.5 | -22.5 |  | High Ch |  |  |  |  |  |  |  |  | 844.00 | 10.75 | V | 1.0 | -1.4 | 8.39 | 38.5 | -30.1 |  | 844.00 | 17.92 | H | 1.0 | -1.4 | 15.57 | 38.5 | -22.9 |  |
| f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | SG reading<br>(dBm)                                                       | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB)                             | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                           |                    |                                                |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| 829.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 12.21                                                                     | V                  | 1.0                                            | -1.5                  | 9.80         | 38.5           | -28.7         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| 829.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 18.73                                                                     | H                  | 1.0                                            | -1.5                  | 16.32        | 38.5           | -22.2         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                           |                    |                                                |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| 836.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 11.17                                                                     | V                  | 1.0                                            | -1.4                  | 8.79         | 38.5           | -29.7         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| 836.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 18.40                                                                     | H                  | 1.0                                            | -1.4                  | 16.02        | 38.5           | -22.5         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                           |                    |                                                |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| 844.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 10.75                                                                     | V                  | 1.0                                            | -1.4                  | 8.39         | 38.5           | -30.1         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| 844.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 17.92                                                                     | H                  | 1.0                                            | -1.4                  | 15.57        | 38.5           | -22.9         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| LTE<br><br>Band 5<br><br>10MHz<br><br>16QAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | UL Verification Services, Inc.<br>High Frequency Substitution Measurement |                    |                                                |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Company:                                                                  |                    | Samsung                                        |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Project #:                                                                |                    | 4788372835                                     |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Date:                                                                     |                    | 2018-03-19                                     |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Test Engineer:                                                            |                    | 47989                                          |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Configuration:                                                            |                    | EUT / X-Position                               |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Location:                                                                 |                    | Chamber 1                                      |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Mode:                                                                     |                    | LTE_16QAM Band 5 Fundamentals, 10MHz Bandwidth |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Test Equipment:                                                           |                    |                                                |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Receiving: VULB9163-845, and Chamber 2 SMA Cables                         |                    |                                                |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| Substitution: Dipole 3121_DB4, 3m N-type Cable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                           |                    |                                                |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBd)</th><th>ERP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>829.00</td><td>11.24</td><td>V</td><td>1.0</td><td>-1.5</td><td>8.83</td><td>38.5</td><td>-29.7</td><td></td></tr><tr><td>829.00</td><td>17.91</td><td>H</td><td>1.0</td><td>-1.5</td><td>15.50</td><td>38.5</td><td>-23.0</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>836.50</td><td>10.19</td><td>V</td><td>1.0</td><td>-1.4</td><td>7.81</td><td>38.5</td><td>-30.7</td><td></td></tr><tr><td>836.50</td><td>17.43</td><td>H</td><td>1.0</td><td>-1.4</td><td>15.05</td><td>38.5</td><td>-23.5</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>844.00</td><td>9.66</td><td>V</td><td>1.0</td><td>-1.4</td><td>7.30</td><td>38.5</td><td>-31.2</td><td></td></tr><tr><td>844.00</td><td>16.74</td><td>H</td><td>1.0</td><td>-1.4</td><td>14.39</td><td>38.5</td><td>-24.1</td><td></td></tr></table>  |                                                                           |                    |                                                |                       |              |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 829.00 | 11.24 | V | 1.0 | -1.5 | 8.83 | 38.5 | -29.7 |  | 829.00 | 17.91 | H | 1.0 | -1.5 | 15.50 | 38.5 | -23.0 |  | Mid Ch |  |  |  |  |  |  |  |  | 836.50 | 10.19 | V | 1.0 | -1.4 | 7.81 | 38.5 | -30.7 |  | 836.50 | 17.43 | H | 1.0 | -1.4 | 15.05 | 38.5 | -23.5 |  | High Ch |  |  |  |  |  |  |  |  | 844.00 | 9.66  | V | 1.0 | -1.4 | 7.30 | 38.5 | -31.2 |  | 844.00 | 16.74 | H | 1.0 | -1.4 | 14.39 | 38.5 | -24.1 |  |
| f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | SG reading<br>(dBm)                                                       | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB)                             | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                           |                    |                                                |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| 829.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 11.24                                                                     | V                  | 1.0                                            | -1.5                  | 8.83         | 38.5           | -29.7         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| 829.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 17.91                                                                     | H                  | 1.0                                            | -1.5                  | 15.50        | 38.5           | -23.0         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                           |                    |                                                |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| 836.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 10.19                                                                     | V                  | 1.0                                            | -1.4                  | 7.81         | 38.5           | -30.7         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| 836.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 17.43                                                                     | H                  | 1.0                                            | -1.4                  | 15.05        | 38.5           | -23.5         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                           |                    |                                                |                       |              |                |               |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| 844.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 9.66                                                                      | V                  | 1.0                                            | -1.4                  | 7.30         | 38.5           | -31.2         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| 844.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 16.74                                                                     | H                  | 1.0                                            | -1.4                  | 14.39        | 38.5           | -24.1         |       |          |                     |                    |                    |                       |              |                |               |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |

LTE

Band 5

5MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4788372835

2018-03-19

47989

EUT / X-Position

Chamber 1

LTE\_QPSK Band 5 Fundamentals, 5MHz Bandwidth

Test Equipment:

Receiving: VULB9163-845, and Chamber 2 SMA Cables

Substitution: Dipole 3121\_DB4, 3m N-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|---------------|-------|
| Low Ch   |                     |                    |                    |                       |              |                |               |       |
| 826.50   | 12.27               | V                  | 1.0                | -1.5                  | 9.85         | 38.5           | -28.6         |       |
| 826.50   | 18.50               | H                  | 1.0                | -1.5                  | 16.08        | 38.5           | -22.4         |       |
| Mid Ch   |                     |                    |                    |                       |              |                |               |       |
| 836.50   | 11.23               | V                  | 1.0                | -1.4                  | 8.85         | 38.5           | -29.6         |       |
| 836.50   | 18.07               | H                  | 1.0                | -1.4                  | 15.69        | 38.5           | -22.8         |       |
| High Ch  |                     |                    |                    |                       |              |                |               |       |
| 846.50   | 9.34                | V                  | 1.0                | -1.4                  | 6.99         | 38.5           | -31.5         |       |
| 846.50   | 17.11               | H                  | 1.0                | -1.4                  | 14.76        | 38.5           | -23.7         |       |

LTE

Band 5

5MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4788372835

2018-03-19

47989

EUT / X-Position

Chamber 1

LTE\_16QAM Band 5 Fundamentals, 5MHz Bandwidth

Test Equipment:

Receiving: VULB9163-845, and Chamber 2 SMA Cables

Substitution: Dipole 3121\_DB4, 3m N-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|---------------|-------|
| Low Ch   |                     |                    |                    |                       |              |                |               |       |
| 826.50   | 11.26               | V                  | 1.0                | -1.5                  | 8.84         | 38.5           | -29.7         |       |
| 826.50   | 17.49               | H                  | 1.0                | -1.5                  | 15.07        | 38.5           | -23.4         |       |
| Mid Ch   |                     |                    |                    |                       |              |                |               |       |
| 836.50   | 9.94                | V                  | 1.0                | -1.4                  | 7.56         | 38.5           | -30.9         |       |
| 836.50   | 17.15               | H                  | 1.0                | -1.4                  | 14.77        | 38.5           | -23.7         |       |
| High Ch  |                     |                    |                    |                       |              |                |               |       |
| 846.50   | 8.34                | V                  | 1.0                | -1.4                  | 5.99         | 38.5           | -32.5         |       |
| 846.50   | 16.18               | H                  | 1.0                | -1.4                  | 13.83        | 38.5           | -24.7         |       |

LTE

Band 5

3MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Samsung

Project #:

4788372835

Date:

2018-03-19

Test Engineer:

47989

Configuration:

EUT / X-Position

Location:

Chamber 1

Mode:

LTE\_QPSK Band 5 Fundamentals, 3MHz Bandwidth

Test Equipment:

Receiving: VULB9163-845, and Chamber 2 SMA Cables

Substitution: Dipole 3121\_DB4, 3m N-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|---------------|-------|
| Low Ch   |                     |                    |                    |                       |              |                |               |       |
| 825.50   | 12.48               | V                  | 1.0                | -1.5                  | 10.05        | 38.5           | -28.4         |       |
| 825.50   | 18.87               | H                  | 1.0                | -1.5                  | 16.45        | 38.5           | -22.0         |       |
| Mid Ch   |                     |                    |                    |                       |              |                |               |       |
| 836.50   | 11.26               | V                  | 1.0                | -1.4                  | 8.88         | 38.5           | -29.6         |       |
| 836.50   | 17.95               | H                  | 1.0                | -1.4                  | 15.57        | 38.5           | -22.9         |       |
| High Ch  |                     |                    |                    |                       |              |                |               |       |
| 847.50   | 9.79                | V                  | 1.0                | -1.4                  | 7.45         | 38.5           | -31.1         |       |
| 847.50   | 16.82               | H                  | 1.0                | -1.4                  | 14.48        | 38.5           | -24.0         |       |

LTE

Band 5

3MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Samsung

Project #:

4788372835

Date:

2018-03-19

Test Engineer:

47989

Configuration:

EUT / X-Position

Location:

Chamber 1

Mode:

LTE\_16QAM Band 5 Fundamentals, 3MHz Bandwidth

Test Equipment:

Receiving: VULB9163-845, and Chamber 2 SMA Cables

Substitution: Dipole 3121\_DB4, 3m N-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|---------------|-------|
| Low Ch   |                     |                    |                    |                       |              |                |               |       |
| 825.50   | 11.38               | V                  | 1.0                | -1.5                  | 8.95         | 38.5           | -29.5         |       |
| 825.50   | 17.84               | H                  | 1.0                | -1.5                  | 15.42        | 38.5           | -23.1         |       |
| Mid Ch   |                     |                    |                    |                       |              |                |               |       |
| 836.50   | 10.35               | V                  | 1.0                | -1.4                  | 7.97         | 38.5           | -30.5         |       |
| 836.50   | 16.97               | H                  | 1.0                | -1.4                  | 14.59        | 38.5           | -23.9         |       |
| High Ch  |                     |                    |                    |                       |              |                |               |       |
| 847.50   | 8.91                | V                  | 1.0                | -1.4                  | 6.57         | 38.5           | -31.9         |       |
| 847.50   | 15.85               | H                  | 1.0                | -1.4                  | 13.51        | 38.5           | -25.0         |       |

|                                  |                                                                                                                                                                                                          |                     |                    |                    |                       |              |                |               |       |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|---------------|-------|
| LTE<br>Band 5<br>1.4MHz<br>QPSK  | UL Verification Services, Inc.<br>High Frequency Substitution Measurement                                                                                                                                |                     |                    |                    |                       |              |                |               |       |
|                                  | Company: Samsung<br>Project #: 4788372835<br>Date: 2018-03-19<br>Test Engineer: 47989<br>Configuration: EUT / X-Position<br>Location: Chamber 1<br>Mode: LTE_QPSK Band 5 Fundamentals, 1.4MHz Bandwidth  |                     |                    |                    |                       |              |                |               |       |
|                                  | Test Equipment:<br>Receiving: VULB9163-845, and Chamber 2 SMA Cables<br>Substitution: Dipole 3121_DB4, 3m N-type Cable                                                                                   |                     |                    |                    |                       |              |                |               |       |
|                                  | f<br>MHz                                                                                                                                                                                                 | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|                                  | Low Ch                                                                                                                                                                                                   |                     |                    |                    |                       |              |                |               |       |
|                                  | 824.70                                                                                                                                                                                                   | 10.61               | V                  | 1.0                | -1.5                  | 8.19         | 38.5           | -30.3         |       |
|                                  | 824.70                                                                                                                                                                                                   | 16.40               | H                  | 1.0                | -1.5                  | 13.98        | 38.5           | -24.5         |       |
|                                  | Mid Ch                                                                                                                                                                                                   |                     |                    |                    |                       |              |                |               |       |
|                                  | 836.50                                                                                                                                                                                                   | 8.96                | V                  | 1.0                | -1.4                  | 6.58         | 38.5           | -31.9         |       |
|                                  | 836.50                                                                                                                                                                                                   | 14.83               | H                  | 1.0                | -1.4                  | 12.45        | 38.5           | -26.1         |       |
| LTE<br>Band 5<br>1.4MHz<br>16QAM | High Ch                                                                                                                                                                                                  |                     |                    |                    |                       |              |                |               |       |
|                                  | 848.30                                                                                                                                                                                                   | 6.70                | V                  | 1.0                | -1.4                  | 4.36         | 38.5           | -34.1         |       |
|                                  | 848.30                                                                                                                                                                                                   | 14.67               | H                  | 1.0                | -1.4                  | 12.33        | 38.5           | -26.2         |       |
|                                  |                                                                                                                                                                                                          |                     |                    |                    |                       |              |                |               |       |
|                                  |                                                                                                                                                                                                          |                     |                    |                    |                       |              |                |               |       |
|                                  |                                                                                                                                                                                                          |                     |                    |                    |                       |              |                |               |       |
|                                  |                                                                                                                                                                                                          |                     |                    |                    |                       |              |                |               |       |
|                                  |                                                                                                                                                                                                          |                     |                    |                    |                       |              |                |               |       |
|                                  |                                                                                                                                                                                                          |                     |                    |                    |                       |              |                |               |       |
|                                  |                                                                                                                                                                                                          |                     |                    |                    |                       |              |                |               |       |
| LTE<br>Band 5<br>1.4MHz<br>16QAM | UL Verification Services, Inc.<br>High Frequency Substitution Measurement                                                                                                                                |                     |                    |                    |                       |              |                |               |       |
|                                  | Company: Samsung<br>Project #: 4788372835<br>Date: 2018-03-19<br>Test Engineer: 47989<br>Configuration: EUT / X-Position<br>Location: Chamber 1<br>Mode: LTE_16QAM Band 5 Fundamentals, 1.4MHz Bandwidth |                     |                    |                    |                       |              |                |               |       |
|                                  | Test Equipment:<br>Receiving: VULB9163-845, and Chamber 2 SMA Cables<br>Substitution: Dipole 3121_DB4, 3m N-type Cable                                                                                   |                     |                    |                    |                       |              |                |               |       |
|                                  | f<br>MHz                                                                                                                                                                                                 | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|                                  | Low Ch                                                                                                                                                                                                   |                     |                    |                    |                       |              |                |               |       |
|                                  | 824.70                                                                                                                                                                                                   | 9.64                | V                  | 1.0                | -1.5                  | 7.22         | 38.5           | -31.3         |       |
|                                  | 824.70                                                                                                                                                                                                   | 15.56               | H                  | 1.0                | -1.5                  | 13.14        | 38.5           | -25.4         |       |
|                                  | Mid Ch                                                                                                                                                                                                   |                     |                    |                    |                       |              |                |               |       |
|                                  | 836.50                                                                                                                                                                                                   | 7.98                | V                  | 1.0                | -1.4                  | 5.60         | 38.5           | -32.9         |       |
|                                  | 836.50                                                                                                                                                                                                   | 13.89               | H                  | 1.0                | -1.4                  | 11.51        | 38.5           | -27.0         |       |
| LTE<br>Band 5<br>1.4MHz<br>16QAM | High Ch                                                                                                                                                                                                  |                     |                    |                    |                       |              |                |               |       |
|                                  | 848.30                                                                                                                                                                                                   | 5.66                | V                  | 1.0                | -1.4                  | 3.32         | 38.5           | -35.2         |       |
|                                  | 848.30                                                                                                                                                                                                   | 13.74               | H                  | 1.0                | -1.4                  | 11.40        | 38.5           | -27.1         |       |
|                                  |                                                                                                                                                                                                          |                     |                    |                    |                       |              |                |               |       |
|                                  |                                                                                                                                                                                                          |                     |                    |                    |                       |              |                |               |       |
|                                  |                                                                                                                                                                                                          |                     |                    |                    |                       |              |                |               |       |
|                                  |                                                                                                                                                                                                          |                     |                    |                    |                       |              |                |               |       |
|                                  |                                                                                                                                                                                                          |                     |                    |                    |                       |              |                |               |       |
|                                  |                                                                                                                                                                                                          |                     |                    |                    |                       |              |                |               |       |
|                                  |                                                                                                                                                                                                          |                     |                    |                    |                       |              |                |               |       |

**LTE Band 41**

| LTE<br><br>Band 41<br><br>20MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4788371689<br/>Date: 2018-03-20<br/>Test Engineer: 47989<br/>Configuration: EUT / X-Position<br/>Location: Chamber 2<br/>Mode: LTE_QPSK Band 41 Fundamentals, 20MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00161451], 3m N-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2506.00</td><td>11.37</td><td>V</td><td>5.3</td><td>10.3</td><td>16.31</td><td>33.0</td><td>-16.7</td></tr><tr><td>2506.00</td><td>13.06</td><td>H</td><td>5.3</td><td>10.3</td><td>17.99</td><td>33.0</td><td>-15.0</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2593.00</td><td>11.57</td><td>V</td><td>5.4</td><td>10.1</td><td>16.24</td><td>33.0</td><td>-16.8</td></tr><tr><td>2593.00</td><td>14.12</td><td>H</td><td>5.4</td><td>10.1</td><td>18.79</td><td>33.0</td><td>-14.2</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2680.00</td><td>14.24</td><td>V</td><td>5.5</td><td>10.2</td><td>18.87</td><td>33.0</td><td>-14.1</td></tr><tr><td>2680.00</td><td>16.54</td><td>H</td><td>5.5</td><td>10.2</td><td>21.17</td><td>33.0</td><td>-11.8</td></tr></table>  |                     |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  | 2506.00 | 11.37 | V | 5.3 | 10.3 | 16.31 | 33.0 | -16.7 | 2506.00 | 13.06 | H | 5.3 | 10.3 | 17.99 | 33.0 | -15.0 | Mid Ch |  |  |  |  |  |  |  | 2593.00 | 11.57 | V | 5.4 | 10.1 | 16.24 | 33.0 | -16.8 | 2593.00 | 14.12 | H | 5.4 | 10.1 | 18.79 | 33.0 | -14.2 | High Ch |  |  |  |  |  |  |  | 2680.00 | 14.24 | V | 5.5 | 10.2 | 18.87 | 33.0 | -14.1 | 2680.00 | 16.54 | H | 5.5 | 10.2 | 21.17 | 33.0 | -11.8 |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|----------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|--------|--|--|--|--|--|--|--|---------|-------|---|-----|------|-------|------|-------|---------|-------|---|-----|------|-------|------|-------|--------|--|--|--|--|--|--|--|---------|-------|---|-----|------|-------|------|-------|---------|-------|---|-----|------|-------|------|-------|---------|--|--|--|--|--|--|--|---------|-------|---|-----|------|-------|------|-------|---------|-------|---|-----|------|-------|------|-------|
|                                              | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                              | 2506.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 11.37               | V                  | 5.3                | 10.3                  | 16.31         | 33.0           | -16.7         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                              | 2506.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 13.06               | H                  | 5.3                | 10.3                  | 17.99         | 33.0           | -15.0         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                              | 2593.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 11.57               | V                  | 5.4                | 10.1                  | 16.24         | 33.0           | -16.8         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                              | 2593.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 14.12               | H                  | 5.4                | 10.1                  | 18.79         | 33.0           | -14.2         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                              | 2680.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 14.24               | V                  | 5.5                | 10.2                  | 18.87         | 33.0           | -14.1         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
| 2680.00                                      | 16.54                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | H                   | 5.5                | 10.2               | 21.17                 | 33.0          | -11.8          |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
| LTE<br><br>Band 41<br><br>20MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4788371689<br/>Date: 2018-03-20<br/>Test Engineer: 47989<br/>Configuration: EUT / X-Position<br/>Location: Chamber 2<br/>Mode: LTE_16QAM Band 41 Fundamentals, 20MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00161451], 3m N-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2506.00</td><td>10.36</td><td>V</td><td>5.3</td><td>10.3</td><td>15.30</td><td>33.0</td><td>-17.7</td></tr><tr><td>2506.00</td><td>12.07</td><td>H</td><td>5.3</td><td>10.3</td><td>17.00</td><td>33.0</td><td>-16.0</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2593.00</td><td>10.67</td><td>V</td><td>5.4</td><td>10.1</td><td>15.34</td><td>33.0</td><td>-17.7</td></tr><tr><td>2593.00</td><td>13.22</td><td>H</td><td>5.4</td><td>10.1</td><td>17.89</td><td>33.0</td><td>-15.1</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2680.00</td><td>13.78</td><td>V</td><td>5.5</td><td>10.2</td><td>18.41</td><td>33.0</td><td>-14.6</td></tr><tr><td>2680.00</td><td>15.61</td><td>H</td><td>5.5</td><td>10.2</td><td>20.24</td><td>33.0</td><td>-12.8</td></tr></table> |                     |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  | 2506.00 | 10.36 | V | 5.3 | 10.3 | 15.30 | 33.0 | -17.7 | 2506.00 | 12.07 | H | 5.3 | 10.3 | 17.00 | 33.0 | -16.0 | Mid Ch |  |  |  |  |  |  |  | 2593.00 | 10.67 | V | 5.4 | 10.1 | 15.34 | 33.0 | -17.7 | 2593.00 | 13.22 | H | 5.4 | 10.1 | 17.89 | 33.0 | -15.1 | High Ch |  |  |  |  |  |  |  | 2680.00 | 13.78 | V | 5.5 | 10.2 | 18.41 | 33.0 | -14.6 | 2680.00 | 15.61 | H | 5.5 | 10.2 | 20.24 | 33.0 | -12.8 |
|                                              | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                              | 2506.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 10.36               | V                  | 5.3                | 10.3                  | 15.30         | 33.0           | -17.7         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                              | 2506.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 12.07               | H                  | 5.3                | 10.3                  | 17.00         | 33.0           | -16.0         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                              | 2593.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 10.67               | V                  | 5.4                | 10.1                  | 15.34         | 33.0           | -17.7         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                              | 2593.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 13.22               | H                  | 5.4                | 10.1                  | 17.89         | 33.0           | -15.1         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                              | 2680.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 13.78               | V                  | 5.5                | 10.2                  | 18.41         | 33.0           | -14.6         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
| 2680.00                                      | 15.61                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | H                   | 5.5                | 10.2               | 20.24                 | 33.0          | -12.8          |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |

| LTE<br>Band 41<br>15MHz<br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4788371689<br/>Date: 2018-03-20<br/>Test Engineer: 47989<br/>Configuration: EUT / X-Position<br/>Location: Chamber 2<br/>Mode: LTE_QPSK Band 41 Fundamentals, 15MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00161451], 3m N-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2503.50</td><td>10.84</td><td>V</td><td>5.3</td><td>10.3</td><td>15.80</td><td>33.0</td><td>-17.2</td></tr><tr><td>2503.50</td><td>12.25</td><td>H</td><td>5.3</td><td>10.3</td><td>17.20</td><td>33.0</td><td>-15.8</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2593.00</td><td>11.81</td><td>V</td><td>5.4</td><td>10.1</td><td>16.48</td><td>33.0</td><td>-16.5</td></tr><tr><td>2593.00</td><td>13.73</td><td>H</td><td>5.4</td><td>10.1</td><td>18.40</td><td>33.0</td><td>-14.6</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2682.50</td><td>12.44</td><td>V</td><td>5.5</td><td>10.2</td><td>17.07</td><td>33.0</td><td>-15.9</td></tr><tr><td>2682.50</td><td>16.48</td><td>H</td><td>5.5</td><td>10.2</td><td>21.11</td><td>33.0</td><td>-11.9</td></tr></table> |                     |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  | 2503.50 | 10.84 | V | 5.3 | 10.3 | 15.80 | 33.0 | -17.2 | 2503.50 | 12.25 | H | 5.3 | 10.3 | 17.20 | 33.0 | -15.8 | Mid Ch |  |  |  |  |  |  |  | 2593.00 | 11.81 | V | 5.4 | 10.1 | 16.48 | 33.0 | -16.5 | 2593.00 | 13.73 | H | 5.4 | 10.1 | 18.40 | 33.0 | -14.6 | High Ch |  |  |  |  |  |  |  | 2682.50 | 12.44 | V | 5.5 | 10.2 | 17.07 | 33.0 | -15.9 | 2682.50 | 16.48 | H | 5.5 | 10.2 | 21.11 | 33.0 | -11.9 |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|----------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|--------|--|--|--|--|--|--|--|---------|-------|---|-----|------|-------|------|-------|---------|-------|---|-----|------|-------|------|-------|--------|--|--|--|--|--|--|--|---------|-------|---|-----|------|-------|------|-------|---------|-------|---|-----|------|-------|------|-------|---------|--|--|--|--|--|--|--|---------|-------|---|-----|------|-------|------|-------|---------|-------|---|-----|------|-------|------|-------|
|                                  | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                  | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                  | 2503.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 10.84               | V                  | 5.3                | 10.3                  | 15.80         | 33.0           | -17.2         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                  | 2503.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 12.25               | H                  | 5.3                | 10.3                  | 17.20         | 33.0           | -15.8         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                  | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                  | 2593.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 11.81               | V                  | 5.4                | 10.1                  | 16.48         | 33.0           | -16.5         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                  | 2593.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 13.73               | H                  | 5.4                | 10.1                  | 18.40         | 33.0           | -14.6         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                  | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                  | 2682.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 12.44               | V                  | 5.5                | 10.2                  | 17.07         | 33.0           | -15.9         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
| 2682.50                          | 16.48                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | H                   | 5.5                | 10.2               | 21.11                 | 33.0          | -11.9          |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
| LTE<br>Band 41<br>15MHz<br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4788371689<br/>Date: 2018-03-20<br/>Test Engineer: 47989<br/>Configuration: EUT / X-Position<br/>Location: Chamber 2<br/>Mode: LTE_16QAM Band 41 Fundamentals, 15MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00161451], 3m N-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2503.50</td><td>9.93</td><td>V</td><td>5.3</td><td>10.3</td><td>14.89</td><td>33.0</td><td>-18.1</td></tr><tr><td>2503.50</td><td>11.51</td><td>H</td><td>5.3</td><td>10.3</td><td>16.46</td><td>33.0</td><td>-16.5</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2593.00</td><td>10.72</td><td>V</td><td>5.4</td><td>10.1</td><td>15.39</td><td>33.0</td><td>-17.6</td></tr><tr><td>2593.00</td><td>12.78</td><td>H</td><td>5.4</td><td>10.1</td><td>17.45</td><td>33.0</td><td>-15.6</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2682.50</td><td>13.17</td><td>V</td><td>5.5</td><td>10.2</td><td>17.80</td><td>33.0</td><td>-15.2</td></tr><tr><td>2682.50</td><td>16.03</td><td>H</td><td>5.5</td><td>10.2</td><td>20.66</td><td>33.0</td><td>-12.3</td></tr></table> |                     |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  | 2503.50 | 9.93  | V | 5.3 | 10.3 | 14.89 | 33.0 | -18.1 | 2503.50 | 11.51 | H | 5.3 | 10.3 | 16.46 | 33.0 | -16.5 | Mid Ch |  |  |  |  |  |  |  | 2593.00 | 10.72 | V | 5.4 | 10.1 | 15.39 | 33.0 | -17.6 | 2593.00 | 12.78 | H | 5.4 | 10.1 | 17.45 | 33.0 | -15.6 | High Ch |  |  |  |  |  |  |  | 2682.50 | 13.17 | V | 5.5 | 10.2 | 17.80 | 33.0 | -15.2 | 2682.50 | 16.03 | H | 5.5 | 10.2 | 20.66 | 33.0 | -12.3 |
|                                  | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                  | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                  | 2503.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 9.93                | V                  | 5.3                | 10.3                  | 14.89         | 33.0           | -18.1         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                  | 2503.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 11.51               | H                  | 5.3                | 10.3                  | 16.46         | 33.0           | -16.5         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                  | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                  | 2593.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 10.72               | V                  | 5.4                | 10.1                  | 15.39         | 33.0           | -17.6         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                  | 2593.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 12.78               | H                  | 5.4                | 10.1                  | 17.45         | 33.0           | -15.6         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                  | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
|                                  | 2682.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 13.17               | V                  | 5.5                | 10.2                  | 17.80         | 33.0           | -15.2         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |
| 2682.50                          | 16.03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | H                   | 5.5                | 10.2               | 20.66                 | 33.0          | -12.3          |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |      |       |      |       |         |       |   |     |      |       |      |       |





**LTE Band 66**

|                                  |                                                                                                                                                                                                                                                           |                   |                  |                   |                     |              |              |              |              |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------|-------------------|---------------------|--------------|--------------|--------------|--------------|
| LTE<br>Band 66<br>20MHz<br>QPSK  | <b>UL Verification Services, Inc.</b><br><b>High Frequency Substitution Measurement</b>                                                                                                                                                                   |                   |                  |                   |                     |              |              |              |              |
|                                  | <b>Company:</b> Samsung<br><b>Project #:</b> 4788371689<br><b>Date:</b> 2018-03-25<br><b>Test Engineer:</b> 47989<br><b>Configuration:</b> EUT / X-Position<br><b>Location:</b> Chamber 2<br><b>Mode:</b> LTE_QPSK Band 66 Fundamentals, 20MHz Bandwidth  |                   |                  |                   |                     |              |              |              |              |
|                                  | <b>Test Equipment:</b><br>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br>Substitution: Horn 3115[00161451], 3m N-type Cable                                                                                                                  |                   |                  |                   |                     |              |              |              |              |
|                                  | <b>f</b>                                                                                                                                                                                                                                                  | <b>SG reading</b> | <b>Ant. Pol.</b> | <b>Cable Loss</b> | <b>Antenna Gain</b> | <b>EIRP</b>  | <b>Limit</b> | <b>Delta</b> | <b>Notes</b> |
|                                  | <b>MHz</b>                                                                                                                                                                                                                                                | <b>(dBm)</b>      | <b>(H/V)</b>     | <b>(dB)</b>       | <b>(dBi)</b>        | <b>(dBm)</b> | <b>(dBm)</b> | <b>(dB)</b>  |              |
|                                  | Low Ch                                                                                                                                                                                                                                                    |                   |                  |                   |                     |              |              |              |              |
|                                  | 1720.00                                                                                                                                                                                                                                                   | 12.16             | V                | 4.3               | 9.5                 | 17.33        | 30.0         | -12.7        |              |
|                                  | 1720.00                                                                                                                                                                                                                                                   | 17.79             | H                | 4.3               | 9.5                 | 22.96        | 30.0         | -7.0         |              |
|                                  | Mid Ch                                                                                                                                                                                                                                                    |                   |                  |                   |                     |              |              |              |              |
|                                  | 1745.00                                                                                                                                                                                                                                                   | 12.46             | V                | 4.4               | 9.6                 | 17.68        | 30.0         | -12.3        |              |
|                                  | 1745.00                                                                                                                                                                                                                                                   | 17.64             | H                | 4.4               | 9.6                 | 22.86        | 30.0         | -7.1         |              |
|                                  | High Ch                                                                                                                                                                                                                                                   |                   |                  |                   |                     |              |              |              |              |
|                                  | 1770.00                                                                                                                                                                                                                                                   | 12.93             | V                | 4.4               | 9.6                 | 18.16        | 30.0         | -11.8        |              |
|                                  | 1770.00                                                                                                                                                                                                                                                   | 16.36             | H                | 4.4               | 9.6                 | 21.59        | 30.0         | -8.4         |              |
| LTE<br>Band 66<br>20MHz<br>16QAM | <b>UL Verification Services, Inc.</b><br><b>High Frequency Substitution Measurement</b>                                                                                                                                                                   |                   |                  |                   |                     |              |              |              |              |
|                                  | <b>Company:</b> Samsung<br><b>Project #:</b> 4788371689<br><b>Date:</b> 2018-03-25<br><b>Test Engineer:</b> 47989<br><b>Configuration:</b> EUT / X-Position<br><b>Location:</b> Chamber 2<br><b>Mode:</b> LTE_16QAM Band 66 Fundamentals, 20MHz Bandwidth |                   |                  |                   |                     |              |              |              |              |
|                                  | <b>Test Equipment:</b><br>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br>Substitution: Horn 3115[00161451], 3m N-type Cable                                                                                                                  |                   |                  |                   |                     |              |              |              |              |
|                                  | <b>f</b>                                                                                                                                                                                                                                                  | <b>SG reading</b> | <b>Ant. Pol.</b> | <b>Cable Loss</b> | <b>Antenna Gain</b> | <b>EIRP</b>  | <b>Limit</b> | <b>Delta</b> | <b>Notes</b> |
|                                  | <b>MHz</b>                                                                                                                                                                                                                                                | <b>(dBm)</b>      | <b>(H/V)</b>     | <b>(dB)</b>       | <b>(dBi)</b>        | <b>(dBm)</b> | <b>(dBm)</b> | <b>(dB)</b>  |              |
|                                  | Low Ch                                                                                                                                                                                                                                                    |                   |                  |                   |                     |              |              |              |              |
|                                  | 1720.00                                                                                                                                                                                                                                                   | 11.24             | V                | 4.3               | 9.5                 | 16.41        | 30.0         | -13.6        |              |
|                                  | 1720.00                                                                                                                                                                                                                                                   | 16.79             | H                | 4.3               | 9.5                 | 21.96        | 30.0         | -8.0         |              |
|                                  | Mid Ch                                                                                                                                                                                                                                                    |                   |                  |                   |                     |              |              |              |              |
|                                  | 1745.00                                                                                                                                                                                                                                                   | 11.43             | V                | 4.4               | 9.6                 | 16.65        | 30.0         | -13.4        |              |
|                                  | 1745.00                                                                                                                                                                                                                                                   | 16.93             | H                | 4.4               | 9.6                 | 22.15        | 30.0         | -7.9         |              |
|                                  | High Ch                                                                                                                                                                                                                                                   |                   |                  |                   |                     |              |              |              |              |
|                                  | 1770.00                                                                                                                                                                                                                                                   | 11.96             | V                | 4.4               | 9.6                 | 17.19        | 30.0         | -12.8        |              |
|                                  | 1770.00                                                                                                                                                                                                                                                   | 15.36             | H                | 4.4               | 9.6                 | 20.59        | 30.0         | -9.4         |              |

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------|-------------------|---------------------|--------------|--------------|--------------|--------------|
| LTE<br><br>Band 66<br><br>15MHz<br><br>QPSK  | <b>UL Verification Services, Inc.</b><br><b>High Frequency Substitution Measurement</b><br><br><b>Company:</b> Samsung<br><b>Project #:</b> 4788371689<br><b>Date:</b> 2018-03-25<br><b>Test Engineer:</b> 47989<br><b>Configuration:</b> EUT / X-Position<br><b>Location:</b> Chamber 2<br><b>Mode:</b> LTE_QPSK Band 66 Fundamentals, 15MHz Bandwidth<br><br><b>Test Equipment:</b><br>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br>Substitution: Horn 3115[00161451], 3m N-type Cable  |                   |                  |                   |                     |              |              |              |              |
|                                              | <b>f</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>SG reading</b> | <b>Ant. Pol.</b> | <b>Cable Loss</b> | <b>Antenna Gain</b> | <b>EIRP</b>  | <b>Limit</b> | <b>Delta</b> | <b>Notes</b> |
|                                              | <b>MHz</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>(dBm)</b>      | <b>(H/V)</b>     | <b>(dB)</b>       | <b>(dBi)</b>        | <b>(dBm)</b> | <b>(dBm)</b> | <b>(dB)</b>  |              |
|                                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |                  |                   |                     |              |              |              |              |
|                                              | 1717.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 12.13             | V                | 4.3               | 9.5                 | 17.30        | 30.0         | -12.7        |              |
|                                              | 1717.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 18.07             | H                | 4.3               | 9.5                 | 23.23        | 30.0         | -6.8         |              |
|                                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |                  |                   |                     |              |              |              |              |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 12.40             | V                | 4.4               | 9.6                 | 17.62        | 30.0         | -12.4        |              |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 16.91             | H                | 4.4               | 9.6                 | 22.13        | 30.0         | -7.9         |              |
|                                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |                  |                   |                     |              |              |              |              |
| LTE<br><br>Band 66<br><br>15MHz<br><br>16QAM | 1772.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 13.43             | V                | 4.4               | 9.6                 | 18.67        | 30.0         | -11.3        |              |
|                                              | 1772.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 16.89             | H                | 4.4               | 9.6                 | 22.13        | 30.0         | -7.9         |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
| LTE<br><br>Band 66<br><br>15MHz<br><br>16QAM | <b>UL Verification Services, Inc.</b><br><b>High Frequency Substitution Measurement</b><br><br><b>Company:</b> Samsung<br><b>Project #:</b> 4788371689<br><b>Date:</b> 2018-03-25<br><b>Test Engineer:</b> 47989<br><b>Configuration:</b> EUT / X-Position<br><b>Location:</b> Chamber 2<br><b>Mode:</b> LTE_16QAM Band 66 Fundamentals, 15MHz Bandwidth<br><br><b>Test Equipment:</b><br>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br>Substitution: Horn 3115[00161451], 3m N-type Cable |                   |                  |                   |                     |              |              |              |              |
|                                              | <b>f</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>SG reading</b> | <b>Ant. Pol.</b> | <b>Cable Loss</b> | <b>Antenna Gain</b> | <b>EIRP</b>  | <b>Limit</b> | <b>Delta</b> | <b>Notes</b> |
|                                              | <b>MHz</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>(dBm)</b>      | <b>(H/V)</b>     | <b>(dB)</b>       | <b>(dBi)</b>        | <b>(dBm)</b> | <b>(dBm)</b> | <b>(dB)</b>  |              |
|                                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |                  |                   |                     |              |              |              |              |
|                                              | 1717.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 11.15             | V                | 4.3               | 9.5                 | 16.32        | 30.0         | -13.7        |              |
|                                              | 1717.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 17.13             | H                | 4.3               | 9.5                 | 22.29        | 30.0         | -7.7         |              |
|                                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |                  |                   |                     |              |              |              |              |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 11.51             | V                | 4.4               | 9.6                 | 16.73        | 30.0         | -13.3        |              |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 16.15             | H                | 4.4               | 9.6                 | 21.37        | 30.0         | -8.6         |              |
|                                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |                  |                   |                     |              |              |              |              |
| LTE<br><br>Band 66<br><br>15MHz<br><br>16QAM | 1772.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 12.43             | V                | 4.4               | 9.6                 | 17.67        | 30.0         | -12.3        |              |
|                                              | 1772.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 15.95             | H                | 4.4               | 9.6                 | 21.19        | 30.0         | -8.8         |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                  |                   |                     |              |              |              |              |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------|-------------------|---------------------|--------------|--------------|--------------|--------------|
| LTE<br><br>Band 66<br><br>10MHz<br><br>QPSK  | <b>UL Verification Services, Inc.</b><br><b>High Frequency Substitution Measurement</b><br><br><b>Company:</b> Samsnug<br><b>Project #:</b> 4788371689<br><b>Date:</b> 2018-03-25<br><b>Test Engineer:</b> 51072<br><b>Configuration:</b> EUT / X-Postion<br><b>Location:</b> Chamber 2<br><b>Mode:</b> LTE_QPSK Band 66 Fundamentals, 10MHz Bandwidth<br><br><b>Test Equipment:</b><br><b>Receiving:</b> Horn 3117[00168724], and Chamber 2 SMA Cables<br><b>Substitution:</b> Horn 3115[00161451], 3m N-type Cable  |                   |                  |                   |                     |              |              |              |              |
|                                              | <b>f</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>SG reading</b> | <b>Ant. Pol.</b> | <b>Cable Loss</b> | <b>Antenna Gain</b> | <b>EIRP</b>  | <b>Limit</b> | <b>Delta</b> | <b>Notes</b> |
|                                              | <b>MHz</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>(dBm)</b>      | <b>(H/V)</b>     | <b>(dB)</b>       | <b>(dBi)</b>        | <b>(dBm)</b> | <b>(dBm)</b> | <b>(dB)</b>  |              |
|                                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                   |                  |                   |                     |              |              |              |              |
|                                              | 1715.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 11.39             | V                | 4.3               | 9.5                 | 16.55        | 30.0         | -13.4        |              |
|                                              | 1715.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 17.05             | H                | 4.3               | 9.5                 | 22.21        | 30.0         | -7.8         |              |
|                                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                   |                  |                   |                     |              |              |              |              |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 12.85             | V                | 4.4               | 9.6                 | 18.07        | 30.0         | -11.9        |              |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 17.43             | H                | 4.4               | 9.6                 | 22.65        | 30.0         | -7.4         |              |
|                                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |                  |                   |                     |              |              |              |              |
| LTE<br><br>Band 66<br><br>10MHz<br><br>16QAM | 1775.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 13.51             | V                | 4.4               | 9.6                 | 18.75        | 30.0         | -11.2        |              |
|                                              | 1775.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 16.21             | H                | 4.4               | 9.6                 | 21.45        | 30.0         | -8.6         |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                  |                   |                     |              |              |              |              |
| LTE<br><br>Band 66<br><br>10MHz<br><br>16QAM | <b>UL Verification Services, Inc.</b><br><b>High Frequency Substitution Measurement</b><br><br><b>Company:</b> Samsnug<br><b>Project #:</b> 4788371689<br><b>Date:</b> 2018-03-25<br><b>Test Engineer:</b> 51072<br><b>Configuration:</b> EUT / X-Postion<br><b>Location:</b> Chamber 2<br><b>Mode:</b> LTE_16QAM Band 66 Fundamentals, 10MHz Bandwidth<br><br><b>Test Equipment:</b><br><b>Receiving:</b> Horn 3117[00168724], and Chamber 2 SMA Cables<br><b>Substitution:</b> Horn 3115[00161451], 3m N-type Cable |                   |                  |                   |                     |              |              |              |              |
|                                              | <b>f</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>SG reading</b> | <b>Ant. Pol.</b> | <b>Cable Loss</b> | <b>Antenna Gain</b> | <b>EIRP</b>  | <b>Limit</b> | <b>Delta</b> | <b>Notes</b> |
|                                              | <b>MHz</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>(dBm)</b>      | <b>(H/V)</b>     | <b>(dB)</b>       | <b>(dBi)</b>        | <b>(dBm)</b> | <b>(dBm)</b> | <b>(dB)</b>  |              |
|                                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                   |                  |                   |                     |              |              |              |              |
|                                              | 1715.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 10.41             | V                | 4.3               | 9.5                 | 15.57        | 30.0         | -14.4        |              |
|                                              | 1715.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 16.06             | H                | 4.3               | 9.5                 | 21.22        | 30.0         | -8.8         |              |
|                                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                   |                  |                   |                     |              |              |              |              |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 11.86             | V                | 4.4               | 9.6                 | 17.08        | 30.0         | -12.9        |              |
|                                              | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 16.39             | H                | 4.4               | 9.6                 | 21.61        | 30.0         | -8.4         |              |
|                                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |                  |                   |                     |              |              |              |              |
| LTE<br><br>Band 66<br><br>10MHz<br><br>16QAM | 1775.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 12.37             | V                | 4.4               | 9.6                 | 17.61        | 30.0         | -12.4        |              |
|                                              | 1775.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 15.33             | H                | 4.4               | 9.6                 | 20.57        | 30.0         | -9.4         |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                  |                   |                     |              |              |              |              |
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                  |                   |                     |              |              |              |              |

|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
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| LTE<br>Band 66<br>5MHz<br>QPSK  | <b>UL Verification Services, Inc.</b><br><b>High Frequency Substitution Measurement</b>                                                                                                                                                                  |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>Company:</b> Samsung<br><b>Project #:</b> 4788371689<br><b>Date:</b> 2018-03-24<br><b>Test Engineer:</b> 51072<br><b>Configuration:</b> EUT / X-Position<br><b>Location:</b> Chamber 2<br><b>Mode:</b> LTE_QPSK Band 66 Fundamentals, 5MHz Bandwidth  |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>Test Equipment:</b><br><b>Receiving:</b> Horn 3117[00168724], and Chamber 2 SMA Cables<br><b>Substitution:</b> Horn 3115[00161451], 3m N-type Cable                                                                                                   |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>f</b>                                                                                                                                                                                                                                                 | <b>SG reading</b> | <b>Ant. Pol.</b> | <b>Cable Loss</b> | <b>Antenna Gain</b> | <b>EIRP</b>  | <b>Limit</b> | <b>Delta</b> | <b>Notes</b> |
|                                 | <b>MHz</b>                                                                                                                                                                                                                                               | <b>(dBm)</b>      | <b>(H/V)</b>     | <b>(dB)</b>       | <b>(dBi)</b>        | <b>(dBm)</b> | <b>(dBm)</b> | <b>(dB)</b>  |              |
|                                 | Low Ch                                                                                                                                                                                                                                                   |                   |                  |                   |                     |              |              |              |              |
|                                 | 1712.50                                                                                                                                                                                                                                                  | 11.61             | V                | 4.3               | 9.5                 | 16.77        | 30.0         | -13.2        |              |
|                                 | 1712.50                                                                                                                                                                                                                                                  | 18.08             | H                | 4.3               | 9.5                 | 23.23        | 30.0         | -6.8         |              |
|                                 | Mid Ch                                                                                                                                                                                                                                                   |                   |                  |                   |                     |              |              |              |              |
|                                 | 1745.00                                                                                                                                                                                                                                                  | 11.44             | V                | 4.4               | 9.6                 | 16.66        | 30.0         | -13.3        |              |
| LTE<br>Band 66<br>5MHz<br>16QAM | 1745.00                                                                                                                                                                                                                                                  | 18.57             | H                | 4.4               | 9.6                 | 23.79        | 30.0         | -6.2         |              |
|                                 | High Ch                                                                                                                                                                                                                                                  |                   |                  |                   |                     |              |              |              |              |
|                                 | 1777.50                                                                                                                                                                                                                                                  | 12.24             | V                | 4.4               | 9.6                 | 17.47        | 30.0         | -12.5        |              |
|                                 | 1777.50                                                                                                                                                                                                                                                  | 18.44             | H                | 4.4               | 9.6                 | 23.68        | 30.0         | -6.3         |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
| LTE<br>Band 66<br>5MHz<br>16QAM | <b>UL Verification Services, Inc.</b><br><b>High Frequency Substitution Measurement</b>                                                                                                                                                                  |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>Company:</b> Samsung<br><b>Project #:</b> 4788371689<br><b>Date:</b> 2018-03-24<br><b>Test Engineer:</b> 51072<br><b>Configuration:</b> EUT / X-Position<br><b>Location:</b> Chamber 2<br><b>Mode:</b> LTE_16QAM Band 66 Fundamentals, 5MHz Bandwidth |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>Test Equipment:</b><br><b>Receiving:</b> Horn 3117[00168724], and Chamber 2 SMA Cables<br><b>Substitution:</b> Horn 3115[00161451], 3m N-type Cable                                                                                                   |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>f</b>                                                                                                                                                                                                                                                 | <b>SG reading</b> | <b>Ant. Pol.</b> | <b>Cable Loss</b> | <b>Antenna Gain</b> | <b>EIRP</b>  | <b>Limit</b> | <b>Delta</b> | <b>Notes</b> |
|                                 | <b>MHz</b>                                                                                                                                                                                                                                               | <b>(dBm)</b>      | <b>(H/V)</b>     | <b>(dB)</b>       | <b>(dBi)</b>        | <b>(dBm)</b> | <b>(dBm)</b> | <b>(dB)</b>  |              |
|                                 | Low Ch                                                                                                                                                                                                                                                   |                   |                  |                   |                     |              |              |              |              |
|                                 | 1712.50                                                                                                                                                                                                                                                  | 10.55             | V                | 4.3               | 9.5                 | 15.71        | 30.0         | -14.3        |              |
|                                 | 1712.50                                                                                                                                                                                                                                                  | 17.05             | H                | 4.3               | 9.5                 | 22.20        | 30.0         | -7.8         |              |
|                                 | Mid Ch                                                                                                                                                                                                                                                   |                   |                  |                   |                     |              |              |              |              |
|                                 | 1745.00                                                                                                                                                                                                                                                  | 10.50             | V                | 4.4               | 9.6                 | 15.72        | 30.0         | -14.3        |              |
|                                 | 1745.00                                                                                                                                                                                                                                                  | 17.53             | H                | 4.4               | 9.6                 | 22.75        | 30.0         | -7.3         |              |
| LTE<br>Band 66<br>5MHz<br>16QAM | High Ch                                                                                                                                                                                                                                                  |                   |                  |                   |                     |              |              |              |              |
|                                 | 1777.50                                                                                                                                                                                                                                                  | 11.43             | V                | 4.4               | 9.6                 | 16.66        | 30.0         | -13.3        |              |
|                                 | 1777.50                                                                                                                                                                                                                                                  | 17.26             | H                | 4.4               | 9.6                 | 22.50        | 30.0         | -7.5         |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |

|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------|-------------------|---------------------|--------------|--------------|--------------|--------------|
| LTE<br>Band 66<br>3MHz<br>QPSK  | <b>UL Verification Services, Inc.</b><br><b>High Frequency Substitution Measurement</b>                                                                                                                                                                  |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>Company:</b> Samsnug<br><b>Project #:</b> 4788371689<br><b>Date:</b> 2018-03-23<br><b>Test Engineer:</b> 51072<br><b>Configuration:</b> EUT / X-Position<br><b>Location:</b> Chamber 2<br><b>Mode:</b> LTE_QPSK Band 66 Fundamentals, 3MHz Bandwidth  |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>Test Equipment:</b><br>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br>Substitution: Horn 3115[00161451], 3m N-type Cable                                                                                                                 |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>f</b>                                                                                                                                                                                                                                                 | <b>SG reading</b> | <b>Ant. Pol.</b> | <b>Cable Loss</b> | <b>Antenna Gain</b> | <b>EIRP</b>  | <b>Limit</b> | <b>Delta</b> | <b>Notes</b> |
|                                 | <b>MHz</b>                                                                                                                                                                                                                                               | <b>(dBm)</b>      | <b>(H/V)</b>     | <b>(dB)</b>       | <b>(dBi)</b>        | <b>(dBm)</b> | <b>(dBm)</b> | <b>(dB)</b>  |              |
|                                 | Low Ch                                                                                                                                                                                                                                                   |                   |                  |                   |                     |              |              |              |              |
|                                 | 1711.50                                                                                                                                                                                                                                                  | 11.37             | V                | 4.3               | 9.5                 | 16.52        | 30.0         | -13.5        |              |
|                                 | 1711.50                                                                                                                                                                                                                                                  | 18.21             | H                | 4.3               | 9.5                 | 23.36        | 30.0         | -6.6         |              |
|                                 | Mid Ch                                                                                                                                                                                                                                                   |                   |                  |                   |                     |              |              |              |              |
|                                 | 1745.00                                                                                                                                                                                                                                                  | 11.55             | V                | 4.4               | 9.6                 | 16.77        | 30.0         | -13.2        |              |
| LTE<br>Band 66<br>3MHz<br>16QAM | 1745.00                                                                                                                                                                                                                                                  | 18.53             | H                | 4.4               | 9.6                 | 23.75        | 30.0         | -6.3         |              |
|                                 | High Ch                                                                                                                                                                                                                                                  |                   |                  |                   |                     |              |              |              |              |
|                                 | 1778.50                                                                                                                                                                                                                                                  | 11.78             | V                | 4.4               | 9.6                 | 17.02        | 30.0         | -13.0        |              |
|                                 | 1778.50                                                                                                                                                                                                                                                  | 16.15             | H                | 4.4               | 9.6                 | 21.38        | 30.0         | -8.6         |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
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|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
| LTE<br>Band 66<br>3MHz<br>16QAM | <b>UL Verification Services, Inc.</b><br><b>High Frequency Substitution Measurement</b>                                                                                                                                                                  |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>Company:</b> Samsnug<br><b>Project #:</b> 4788371689<br><b>Date:</b> 2018-03-23<br><b>Test Engineer:</b> 51072<br><b>Configuration:</b> EUT / X-Position<br><b>Location:</b> Chamber 2<br><b>Mode:</b> LTE_16QAM Band 66 Fundamentals, 3MHz Bandwidth |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>Test Equipment:</b><br>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br>Substitution: Horn 3115[00161451], 3m N-type Cable                                                                                                                 |                   |                  |                   |                     |              |              |              |              |
|                                 | <b>f</b>                                                                                                                                                                                                                                                 | <b>SG reading</b> | <b>Ant. Pol.</b> | <b>Cable Loss</b> | <b>Antenna Gain</b> | <b>EIRP</b>  | <b>Limit</b> | <b>Delta</b> | <b>Notes</b> |
|                                 | <b>MHz</b>                                                                                                                                                                                                                                               | <b>(dBm)</b>      | <b>(H/V)</b>     | <b>(dB)</b>       | <b>(dBi)</b>        | <b>(dBm)</b> | <b>(dBm)</b> | <b>(dB)</b>  |              |
|                                 | Low Ch                                                                                                                                                                                                                                                   |                   |                  |                   |                     |              |              |              |              |
|                                 | 1711.50                                                                                                                                                                                                                                                  | 10.34             | V                | 4.3               | 9.5                 | 15.49        | 30.0         | -14.5        |              |
|                                 | 1711.50                                                                                                                                                                                                                                                  | 17.23             | H                | 4.3               | 9.5                 | 22.38        | 30.0         | -7.6         |              |
|                                 | Mid Ch                                                                                                                                                                                                                                                   |                   |                  |                   |                     |              |              |              |              |
|                                 | 1745.00                                                                                                                                                                                                                                                  | 10.53             | V                | 4.4               | 9.6                 | 15.75        | 30.0         | -14.3        |              |
|                                 | 1745.00                                                                                                                                                                                                                                                  | 17.52             | H                | 4.4               | 9.6                 | 22.74        | 30.0         | -7.3         |              |
| LTE<br>Band 66<br>3MHz<br>16QAM | High Ch                                                                                                                                                                                                                                                  |                   |                  |                   |                     |              |              |              |              |
|                                 | 1778.50                                                                                                                                                                                                                                                  | 10.25             | V                | 4.4               | 9.6                 | 15.49        | 30.0         | -14.5        |              |
|                                 | 1778.50                                                                                                                                                                                                                                                  | 15.13             | H                | 4.4               | 9.6                 | 20.36        | 30.0         | -9.6         |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |
|                                 |                                                                                                                                                                                                                                                          |                   |                  |                   |                     |              |              |              |              |

|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------|-------------------|---------------------|--------------|--------------|--------------|--------------|
| LTE<br><br>Band 66<br><br>1.4MHz<br><br>QPSK  | <b>UL Verification Services, Inc.</b><br><b>High Frequency Substitution Measurement</b><br><br><b>Company:</b> Samsung<br><b>Project #:</b> 4788371689<br><b>Date:</b> 2018-03-23<br><b>Test Engineer:</b> 51072<br><b>Configuration:</b> EUT / X-Position<br><b>Location:</b> Chamber 2<br><b>Mode:</b> LTE_QPSK Band 66 Fundamentals, 1.4MHz Bandwidth<br><br><b>Test Equipment:</b><br><b>Receiving:</b> Horn 3117[00168724], and Chamber 2 SMA Cables<br><b>Substitution:</b> Horn 3115[00161451], 3m N-type Cable  |                   |                  |                   |                     |              |              |              |              |
|                                               | <b>f</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>SG reading</b> | <b>Ant. Pol.</b> | <b>Cable Loss</b> | <b>Antenna Gain</b> | <b>EIRP</b>  | <b>Limit</b> | <b>Delta</b> | <b>Notes</b> |
|                                               | <b>MHz</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>(dBm)</b>      | <b>(H/V)</b>     | <b>(dB)</b>       | <b>(dBi)</b>        | <b>(dBm)</b> | <b>(dBm)</b> | <b>(dB)</b>  |              |
|                                               | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |                  |                   |                     |              |              |              |              |
|                                               | 1710.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 9.05              | V                | 4.3               | 9.5                 | 14.19        | 30.0         | -15.8        |              |
|                                               | 1710.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 14.44             | H                | 4.3               | 9.5                 | 19.58        | 30.0         | -10.4        |              |
|                                               | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |                  |                   |                     |              |              |              |              |
|                                               | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 9.97              | V                | 4.4               | 9.6                 | 15.20        | 30.0         | -14.8        |              |
|                                               | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 16.09             | H                | 4.4               | 9.6                 | 21.31        | 30.0         | -8.7         |              |
|                                               | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                   |                  |                   |                     |              |              |              |              |
| LTE<br><br>Band 66<br><br>1.4MHz<br><br>16QAM | 1779.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 9.55              | V                | 4.4               | 9.6                 | 14.79        | 30.0         | -15.2        |              |
|                                               | 1779.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 14.01             | H                | 4.4               | 9.6                 | 19.25        | 30.0         | -10.7        |              |
|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |
|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |
|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |
|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |
|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |
|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |
|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |
|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |
| LTE<br><br>Band 66<br><br>1.4MHz<br><br>16QAM | <b>UL Verification Services, Inc.</b><br><b>High Frequency Substitution Measurement</b><br><br><b>Company:</b> Samsung<br><b>Project #:</b> 4788371689<br><b>Date:</b> 2018-03-23<br><b>Test Engineer:</b> 51072<br><b>Configuration:</b> EUT / X-Position<br><b>Location:</b> Chamber 2<br><b>Mode:</b> LTE_16QAM Band 66 Fundamentals, 1.4MHz Bandwidth<br><br><b>Test Equipment:</b><br><b>Receiving:</b> Horn 3117[00168724], and Chamber 2 SMA Cables<br><b>Substitution:</b> Horn 3115[00161451], 3m N-type Cable |                   |                  |                   |                     |              |              |              |              |
|                                               | <b>f</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>SG reading</b> | <b>Ant. Pol.</b> | <b>Cable Loss</b> | <b>Antenna Gain</b> | <b>EIRP</b>  | <b>Limit</b> | <b>Delta</b> | <b>Notes</b> |
|                                               | <b>MHz</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>(dBm)</b>      | <b>(H/V)</b>     | <b>(dB)</b>       | <b>(dBi)</b>        | <b>(dBm)</b> | <b>(dBm)</b> | <b>(dB)</b>  |              |
|                                               | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |                  |                   |                     |              |              |              |              |
|                                               | 1710.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 8.09              | V                | 4.3               | 9.5                 | 13.23        | 30.0         | -16.8        |              |
|                                               | 1710.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 13.48             | H                | 4.3               | 9.5                 | 18.62        | 30.0         | -11.4        |              |
|                                               | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |                  |                   |                     |              |              |              |              |
|                                               | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 8.91              | V                | 4.4               | 9.6                 | 14.14        | 30.0         | -15.9        |              |
|                                               | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 15.00             | H                | 4.4               | 9.6                 | 20.22        | 30.0         | -9.8         |              |
|                                               | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                   |                  |                   |                     |              |              |              |              |
| LTE<br><br>Band 66<br><br>1.4MHz<br><br>16QAM | 1779.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 8.58              | V                | 4.4               | 9.6                 | 13.82        | 30.0         | -16.2        |              |
|                                               | 1779.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 13.04             | H                | 4.4               | 9.6                 | 18.28        | 30.0         | -11.7        |              |
|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |
|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |
|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |
|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |
|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |
|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |
|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |
|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                  |                   |                     |              |              |              |              |

**LTE Band 2**

| LTE<br><br>Band 2<br><br>20MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4788371689<br/>Date: 2018-03-20<br/>Test Engineer: 45585<br/>Configuration: EUT / Z-Position<br/>Location: Chamber 2<br/>Mode: LTE_QPSK Band 2 Fundamentals, 20MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00161451], 3m N-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1860.00</td><td>12.24</td><td>V</td><td>4.5</td><td>9.4</td><td>17.14</td><td>33.0</td><td>-15.9</td></tr><tr><td>1860.00</td><td>14.58</td><td>H</td><td>4.5</td><td>9.4</td><td>19.48</td><td>33.0</td><td>-13.5</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1880.00</td><td>13.81</td><td>V</td><td>4.5</td><td>9.2</td><td>18.49</td><td>33.0</td><td>-14.5</td></tr><tr><td>1880.00</td><td>14.79</td><td>H</td><td>4.5</td><td>9.2</td><td>19.47</td><td>33.0</td><td>-13.5</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1900.00</td><td>12.94</td><td>V</td><td>4.6</td><td>9.0</td><td>17.40</td><td>33.0</td><td>-15.6</td></tr><tr><td>1900.00</td><td>15.09</td><td>H</td><td>4.6</td><td>9.0</td><td>19.55</td><td>33.0</td><td>-13.5</td></tr></table>  |                     |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  | 1860.00 | 12.24 | V | 4.5 | 9.4 | 17.14 | 33.0 | -15.9 | 1860.00 | 14.58 | H | 4.5 | 9.4 | 19.48 | 33.0 | -13.5 | Mid Ch |  |  |  |  |  |  |  | 1880.00 | 13.81 | V | 4.5 | 9.2 | 18.49 | 33.0 | -14.5 | 1880.00 | 14.79 | H | 4.5 | 9.2 | 19.47 | 33.0 | -13.5 | High Ch |  |  |  |  |  |  |  | 1900.00 | 12.94 | V | 4.6 | 9.0 | 17.40 | 33.0 | -15.6 | 1900.00 | 15.09 | H | 4.6 | 9.0 | 19.55 | 33.0 | -13.5 |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|----------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|--------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|-------|--------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|-------|---------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|-------|
|                                             | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1860.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 12.24               | V                  | 4.5                | 9.4                   | 17.14         | 33.0           | -15.9         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1860.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 14.58               | H                  | 4.5                | 9.4                   | 19.48         | 33.0           | -13.5         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 13.81               | V                  | 4.5                | 9.2                   | 18.49         | 33.0           | -14.5         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 14.79               | H                  | 4.5                | 9.2                   | 19.47         | 33.0           | -13.5         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1900.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 12.94               | V                  | 4.6                | 9.0                   | 17.40         | 33.0           | -15.6         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
| 1900.00                                     | 15.09                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | H                   | 4.6                | 9.0                | 19.55                 | 33.0          | -13.5          |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
| LTE<br><br>Band 2<br><br>20MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4788371689<br/>Date: 2018-03-20<br/>Test Engineer: 45585<br/>Configuration: EUT / Z-Position<br/>Location: Chamber 2<br/>Mode: LTE_16QAM Band 2 Fundamentals, 20MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00161451], 3m N-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1860.00</td><td>11.29</td><td>V</td><td>4.5</td><td>9.4</td><td>16.19</td><td>33.0</td><td>-16.8</td></tr><tr><td>1860.00</td><td>13.59</td><td>H</td><td>4.5</td><td>9.4</td><td>18.49</td><td>33.0</td><td>-14.5</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1880.00</td><td>13.00</td><td>V</td><td>4.5</td><td>9.2</td><td>17.68</td><td>33.0</td><td>-15.3</td></tr><tr><td>1880.00</td><td>13.72</td><td>H</td><td>4.5</td><td>9.2</td><td>18.40</td><td>33.0</td><td>-14.6</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1900.00</td><td>11.92</td><td>V</td><td>4.6</td><td>9.0</td><td>16.38</td><td>33.0</td><td>-16.6</td></tr><tr><td>1900.00</td><td>14.08</td><td>H</td><td>4.6</td><td>9.0</td><td>18.54</td><td>33.0</td><td>-14.5</td></tr></table> |                     |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  | 1860.00 | 11.29 | V | 4.5 | 9.4 | 16.19 | 33.0 | -16.8 | 1860.00 | 13.59 | H | 4.5 | 9.4 | 18.49 | 33.0 | -14.5 | Mid Ch |  |  |  |  |  |  |  | 1880.00 | 13.00 | V | 4.5 | 9.2 | 17.68 | 33.0 | -15.3 | 1880.00 | 13.72 | H | 4.5 | 9.2 | 18.40 | 33.0 | -14.6 | High Ch |  |  |  |  |  |  |  | 1900.00 | 11.92 | V | 4.6 | 9.0 | 16.38 | 33.0 | -16.6 | 1900.00 | 14.08 | H | 4.6 | 9.0 | 18.54 | 33.0 | -14.5 |
|                                             | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1860.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 11.29               | V                  | 4.5                | 9.4                   | 16.19         | 33.0           | -16.8         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1860.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 13.59               | H                  | 4.5                | 9.4                   | 18.49         | 33.0           | -14.5         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 13.00               | V                  | 4.5                | 9.2                   | 17.68         | 33.0           | -15.3         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 13.72               | H                  | 4.5                | 9.2                   | 18.40         | 33.0           | -14.6         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1900.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 11.92               | V                  | 4.6                | 9.0                   | 16.38         | 33.0           | -16.6         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
| 1900.00                                     | 14.08                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | H                   | 4.6                | 9.0                | 18.54                 | 33.0          | -14.5          |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |

| LTE<br><br>Band 2<br><br>15MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4788371689<br/>Date: 2018-03-17<br/>Test Engineer: 45585<br/>Configuration: EUT / Z-Position<br/>Location: Chamber 2<br/>Mode: LTE_QPSK Band 2 Fundamentals, 15MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00161451], 3m N-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1857.50</td><td>12.01</td><td>V</td><td>4.5</td><td>9.4</td><td>16.94</td><td>33.0</td><td>-16.1</td></tr><tr><td>1857.50</td><td>13.42</td><td>H</td><td>4.5</td><td>9.4</td><td>18.35</td><td>33.0</td><td>-14.7</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1880.00</td><td>12.26</td><td>V</td><td>4.5</td><td>9.2</td><td>16.94</td><td>33.0</td><td>-16.1</td></tr><tr><td>1880.00</td><td>15.12</td><td>H</td><td>4.5</td><td>9.2</td><td>19.80</td><td>33.0</td><td>-13.2</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1902.50</td><td>12.65</td><td>V</td><td>4.6</td><td>9.0</td><td>17.07</td><td>33.0</td><td>-15.9</td></tr><tr><td>1902.50</td><td>14.46</td><td>H</td><td>4.6</td><td>9.0</td><td>18.88</td><td>33.0</td><td>-14.1</td></tr></table>   |                     |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  | 1857.50 | 12.01 | V | 4.5 | 9.4 | 16.94 | 33.0 | -16.1 | 1857.50 | 13.42 | H | 4.5 | 9.4 | 18.35 | 33.0 | -14.7 | Mid Ch |  |  |  |  |  |  |  | 1880.00 | 12.26 | V | 4.5 | 9.2 | 16.94 | 33.0 | -16.1 | 1880.00 | 15.12 | H | 4.5 | 9.2 | 19.80 | 33.0 | -13.2 | High Ch |  |  |  |  |  |  |  | 1902.50 | 12.65 | V | 4.6 | 9.0 | 17.07 | 33.0 | -15.9 | 1902.50 | 14.46 | H | 4.6 | 9.0 | 18.88 | 33.0 | -14.1 |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|----------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|--------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|-------|--------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|-------|---------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|-------|
|                                             | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1857.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 12.01               | V                  | 4.5                | 9.4                   | 16.94         | 33.0           | -16.1         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1857.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 13.42               | H                  | 4.5                | 9.4                   | 18.35         | 33.0           | -14.7         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 12.26               | V                  | 4.5                | 9.2                   | 16.94         | 33.0           | -16.1         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 15.12               | H                  | 4.5                | 9.2                   | 19.80         | 33.0           | -13.2         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1902.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 12.65               | V                  | 4.6                | 9.0                   | 17.07         | 33.0           | -15.9         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
| 1902.50                                     | 14.46                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | H                   | 4.6                | 9.0                | 18.88                 | 33.0          | -14.1          |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
| LTE<br><br>Band 2<br><br>15MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4788371689<br/>Date: 2018-03-17<br/>Test Engineer: 45585<br/>Configuration: EUT / Z- Position<br/>Location: Chamber 2<br/>Mode: LTE_16QAM Band 2 Fundamentals, 15MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00161451], 3m N-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1857.50</td><td>11.06</td><td>V</td><td>4.5</td><td>9.4</td><td>15.99</td><td>33.0</td><td>-17.0</td></tr><tr><td>1857.50</td><td>12.54</td><td>H</td><td>4.5</td><td>9.4</td><td>17.47</td><td>33.0</td><td>-15.5</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1880.00</td><td>11.36</td><td>V</td><td>4.5</td><td>9.2</td><td>16.04</td><td>33.0</td><td>-17.0</td></tr><tr><td>1880.00</td><td>14.14</td><td>H</td><td>4.5</td><td>9.2</td><td>18.82</td><td>33.0</td><td>-14.2</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1902.50</td><td>11.65</td><td>V</td><td>4.6</td><td>9.0</td><td>16.07</td><td>33.0</td><td>-16.9</td></tr><tr><td>1902.50</td><td>13.46</td><td>H</td><td>4.6</td><td>9.0</td><td>17.88</td><td>33.0</td><td>-15.1</td></tr></table> |                     |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  | 1857.50 | 11.06 | V | 4.5 | 9.4 | 15.99 | 33.0 | -17.0 | 1857.50 | 12.54 | H | 4.5 | 9.4 | 17.47 | 33.0 | -15.5 | Mid Ch |  |  |  |  |  |  |  | 1880.00 | 11.36 | V | 4.5 | 9.2 | 16.04 | 33.0 | -17.0 | 1880.00 | 14.14 | H | 4.5 | 9.2 | 18.82 | 33.0 | -14.2 | High Ch |  |  |  |  |  |  |  | 1902.50 | 11.65 | V | 4.6 | 9.0 | 16.07 | 33.0 | -16.9 | 1902.50 | 13.46 | H | 4.6 | 9.0 | 17.88 | 33.0 | -15.1 |
|                                             | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1857.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 11.06               | V                  | 4.5                | 9.4                   | 15.99         | 33.0           | -17.0         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1857.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 12.54               | H                  | 4.5                | 9.4                   | 17.47         | 33.0           | -15.5         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 11.36               | V                  | 4.5                | 9.2                   | 16.04         | 33.0           | -17.0         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 14.14               | H                  | 4.5                | 9.2                   | 18.82         | 33.0           | -14.2         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1902.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 11.65               | V                  | 4.6                | 9.0                   | 16.07         | 33.0           | -16.9         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
| 1902.50                                     | 13.46                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | H                   | 4.6                | 9.0                | 17.88                 | 33.0          | -15.1          |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |

| LTE<br><br>Band 2<br><br>10MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4788371689<br/>Date: 2018-03-17<br/>Test Engineer: 45585<br/>Configuration: EUT / Z-Position<br/>Location: Chamber 2<br/>Mode: LTE_QPSK Band 2 Fundamentals, 10MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00161451], 3m N-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1855.00</td><td>11.57</td><td>V</td><td>4.5</td><td>9.5</td><td>16.53</td><td>33.0</td><td>-16.5</td></tr><tr><td>1855.00</td><td>15.25</td><td>H</td><td>4.5</td><td>9.5</td><td>20.20</td><td>33.0</td><td>-12.8</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1880.00</td><td>13.76</td><td>V</td><td>4.5</td><td>9.2</td><td>18.44</td><td>33.0</td><td>-14.6</td></tr><tr><td>1880.00</td><td>15.03</td><td>H</td><td>4.5</td><td>9.2</td><td>19.71</td><td>33.0</td><td>-13.3</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1905.00</td><td>12.73</td><td>V</td><td>4.6</td><td>8.9</td><td>17.11</td><td>33.0</td><td>-15.9</td></tr><tr><td>1905.00</td><td>14.88</td><td>H</td><td>4.6</td><td>8.9</td><td>19.26</td><td>33.0</td><td>-13.7</td></tr></table>   |                     |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  | 1855.00 | 11.57 | V | 4.5 | 9.5 | 16.53 | 33.0 | -16.5 | 1855.00 | 15.25 | H | 4.5 | 9.5 | 20.20 | 33.0 | -12.8 | Mid Ch |  |  |  |  |  |  |  | 1880.00 | 13.76 | V | 4.5 | 9.2 | 18.44 | 33.0 | -14.6 | 1880.00 | 15.03 | H | 4.5 | 9.2 | 19.71 | 33.0 | -13.3 | High Ch |  |  |  |  |  |  |  | 1905.00 | 12.73 | V | 4.6 | 8.9 | 17.11 | 33.0 | -15.9 | 1905.00 | 14.88 | H | 4.6 | 8.9 | 19.26 | 33.0 | -13.7 |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|----------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|--------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|-------|--------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|-------|---------|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|---------|-------|---|-----|-----|-------|------|-------|
|                                             | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1855.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 11.57               | V                  | 4.5                | 9.5                   | 16.53         | 33.0           | -16.5         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1855.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 15.25               | H                  | 4.5                | 9.5                   | 20.20         | 33.0           | -12.8         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 13.76               | V                  | 4.5                | 9.2                   | 18.44         | 33.0           | -14.6         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 15.03               | H                  | 4.5                | 9.2                   | 19.71         | 33.0           | -13.3         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1905.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 12.73               | V                  | 4.6                | 8.9                   | 17.11         | 33.0           | -15.9         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
| 1905.00                                     | 14.88                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | H                   | 4.6                | 8.9                | 19.26                 | 33.0          | -13.7          |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
| LTE<br><br>Band 2<br><br>10MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4788371689<br/>Date: 2018-03-17<br/>Test Engineer: 45585<br/>Configuration: EUT / Z- Position<br/>Location: Chamber 2<br/>Mode: LTE_16QAM Band 2 Fundamentals, 10MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00161451], 3m N-type Cable</div> <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1855.00</td><td>10.54</td><td>V</td><td>4.5</td><td>9.5</td><td>15.50</td><td>33.0</td><td>-17.5</td></tr><tr><td>1855.00</td><td>14.21</td><td>H</td><td>4.5</td><td>9.5</td><td>19.16</td><td>33.0</td><td>-13.8</td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1880.00</td><td>12.64</td><td>V</td><td>4.5</td><td>9.2</td><td>17.32</td><td>33.0</td><td>-15.7</td></tr><tr><td>1880.00</td><td>13.99</td><td>H</td><td>4.5</td><td>9.2</td><td>18.67</td><td>33.0</td><td>-14.3</td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1905.00</td><td>11.67</td><td>V</td><td>4.6</td><td>8.9</td><td>16.05</td><td>33.0</td><td>-16.9</td></tr><tr><td>1905.00</td><td>13.83</td><td>H</td><td>4.6</td><td>8.9</td><td>18.21</td><td>33.0</td><td>-14.8</td></tr></table> |                     |                    |                    |                       |               |                |               |       | f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes | Low Ch |  |  |  |  |  |  |  | 1855.00 | 10.54 | V | 4.5 | 9.5 | 15.50 | 33.0 | -17.5 | 1855.00 | 14.21 | H | 4.5 | 9.5 | 19.16 | 33.0 | -13.8 | Mid Ch |  |  |  |  |  |  |  | 1880.00 | 12.64 | V | 4.5 | 9.2 | 17.32 | 33.0 | -15.7 | 1880.00 | 13.99 | H | 4.5 | 9.2 | 18.67 | 33.0 | -14.3 | High Ch |  |  |  |  |  |  |  | 1905.00 | 11.67 | V | 4.6 | 8.9 | 16.05 | 33.0 | -16.9 | 1905.00 | 13.83 | H | 4.6 | 8.9 | 18.21 | 33.0 | -14.8 |
|                                             | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1855.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 10.54               | V                  | 4.5                | 9.5                   | 15.50         | 33.0           | -17.5         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1855.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 14.21               | H                  | 4.5                | 9.5                   | 19.16         | 33.0           | -13.8         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 12.64               | V                  | 4.5                | 9.2                   | 17.32         | 33.0           | -15.7         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 13.99               | H                  | 4.5                | 9.2                   | 18.67         | 33.0           | -14.3         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                    |                    |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
|                                             | 1905.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 11.67               | V                  | 4.6                | 8.9                   | 16.05         | 33.0           | -16.9         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |
| 1905.00                                     | 13.83                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | H                   | 4.6                | 8.9                | 18.21                 | 33.0          | -14.8          |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |        |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |         |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |         |       |   |     |     |       |      |       |